VIPS: A VISUAL IMAGERY AND PERCEPTION SYSTEM; THE RESULT OF A PROTOCOL ANALYSIS. VOLUME II

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
VIPS is a program (implemented in LISP 1.5) which embodies a psychological theory of visual imagery and form perception. An experimental task was designed which required subjects to perform perceptual activity over an extended time frame. The subject was required to move a small viewing hole about a presented line drawing until being able to produce a verbal recall description and drawn reproduction of the whole picture. The subject was also instructed to "think aloud" during the hole movement prodecure. Transcriptions of selected video-tape protocols served as the immediate basis for VIPS design. Relevant research results of cognitive psychology provided addition-

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al design criteria. Behavioral correspondences between protocols and equivalent traces of VIPS activity indicate theory sufficiency. The theory proposes that visual form perception is a constructive activity involving the coordinated use of several memories and processes, which are defined. The resultant visual image (the perception) is realized by the integration of a succession of views of (fixations upon) the external environment stimulation. A proposal for the form and content of symbolic visual imagery is developed as a necessary part of VIPS. A comparison of recent research indications leads to the proposal that flexibility of information representation is a fundamental aspect of human cognition.

VIPS: A Visual Imagery and Perception System;

the result of a protocol analysis

Volume II

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VOLUME II

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Chapter II.1 ..... Process Implementations

1. The Supplementary Processes

In Chapter I.4 an overview of VIPS is presented in terms of its constituent memories and processes and their general interactions and characteristics. In that chapter, the assimilation-accomodation process (AA-SYS) is described as being the primary and driving process within the perceptual system's cycle of processing activity. That process appropriately activates any of the other three supporting, supplementary perception processes, which all return control to AA-SYS upon completion of the prescribed and possible processing.

These three supporting processes are the subject of this chapter section. They are earlier descussed in terms of their activation criteria and functional role in the processing cycle and in terms of the memories which they may access and alter. In this chapter, the constituent rules of each process' production system implementation will be presented and discussed. Each rule's specific conditions for "firing" and the resultant action taken by that rule will be noted, with explanation as necessary.

Before proceeding with this exposition, consider the nature of the inferential derivation of these processes. Their specification is primarily a function of each process's place within the inferred system's general structure, the characteristics of those memories accessed and altered, and the functional role each plays in the perceptual processing. Their specification is thus only indirectly based upon the

protocol data. Each rule must first conform to criteria arising from the overall system architecture.

VI-SYS

As noted in the preceding chapter, VI-SYS is defined as being the same for all subjects. The primary difference between subjects is their use of goals; which ones, and how and when utilized. The rules of VI-SYS depend only upon the contents of the visual register and picture in their condition part and can alter only the contents of the visual register through their action part. Since the visual register and picture are defined to be the same for all subjects, VI-SYS naturally is likewise constant. The goal use of each subject will effect the utilization of the visual register and thus, indirectly, VI-SYS operation, but not the definition of either the visual register or the visual input process.

As can be seen in Appendix A.VI-SYS, there are only four basic operations employed in the condition parts and only eight basic operations employed in the action parts of the constituent rules of VI-SYS. The firing of a rule of the process primarily depends upon which cells of the visual register have values specified, and then secondarily upon the reklationship between those cell values and the PICTURE values accessed. VI-SYS checks if a cell has been loaded with a value prior to activation by the use of the NULL operation. This is a LISP operation which is true (succeeds) if its argument cell has not been specified.

The "(#CPP: $$ NX DIR $1 $2)" condition operation checks if, from the current picture position, a line in direction DIR exists; setting $2 to the name of the vertex in that direction and $1 to the range of the move required, if such line and vertex exist.

The "(#CPP: $$ AX DIR $1 $2)" condition operations checks if a vertex exists, from the current picture position, in direction DIR though no connecting line exists between the two position vertices. Again, $2 is set to the vertex in the specified direction and $1 is set to the range of the required move.

The last condition operation, "(#PIC: $2 $$ RESULT ATT STA)", is only utilized when the ATT cell of the visual register is specified. It checks if the ATT side of the newly reached vertex ($2) is straight (has a 180 degree or STA angle value).

The eight action operations are listed as follows, with a short explanation of their effect upon the visual register:

(SETQ XY) - places the value of Y in cell X of the visual register

(UCPP X) - updates the current picture pointer to the vertex representation of name X within the PICTURE memory

(BUL) - begin unknown line. The vertex on the side opposite ATT is not fully represented, only the number of vertex exists as noted, through use of the QUICKSEE image element. This partial line structure is placed in VI of the visual register.

(CUL) - continue unknown line. Another incomplete vertex representation is added to an incomplete line image structure existing in VI of the visual register.

(FUL) - finish unknown line. Completes the previously existing partial line structure in VI of the visual register.

(PVI) - places the new vertex information or image into the VI cell of the visual register.

(CEX) - checks if the completely expected vertex is the one reached, entering YES or NO in the EXP cell of the visual register.

(CAX) - utilized when both EXP and ATT are specified. Checks if the angle on the ATT side of the new vertex is as expected, enter YES, NO, or CON into the EXP cell of the visual register.

The image structure created from the newly acquired PICTURE information and placed into the VI cell by several of the above described operations is an image chunk, as described in Chapter I.3. When in VI this image chunk representation has not yet been related spatially or by equivalence to the current contents (chunks) of STM. Creating these relations is the primary activity of the assimilation-accomodation process, upon the completion and deactivation of the visual input processing. It is important to understand that by use of expectations (specification of the EXP cell of the visual register) that are satisfied, this image chunk in VI may never by placed into Short Term Memory. Another process may have already hypothesized or remembered (accessed) a structure which accounts for (represents) this information. In the extreme, when expectations are satisfied (EXP is YES), VI will not even be attended to by AA-SYS, with a rule firing and action being taken solely on the basis of the returned YES value of EXP.

The simplicity and uniformity of definition, and the speed and minimal complexity of operation of the proposed visual input process is an important factor in support of the visual processing system as proposed. The process' employment by any subject may vary in accordance with each one's perceptual goals and strategies, yet the basic procedures available and the possible returned information values and structures remain constant and equivalent for this task.

REC-SYS

The implemented version of REC-SYS, as listed in appendix A.REC-SYS, is utilized by all of the developed subject models. A list of necessary mnemonic expansions is

included preceding the process listing. As noted in the preceding chapter, REC-SYS does vary to some degree with differing models due to the different goal systems utilized. The implemented REC-SYS is a union of those rules necessary to account for the perceptual behavior of the chosen subject protocols.

The basic set of rules, put to use by all of the subject models, are the rules REC0, REC1 up to REC16, RIC1, RIC2 and ROU1. These rules traverse the image representation in short term memory and construct a complete or incomplete object model based upon the information acquired by means of that image memory traversal. These rules will try to name any resulting complete object image structure, or propose and complete a known object image as goal and perceptaul guide when only incomplete object information is acquired through traversal.

At times, due to goal and information circumstances, AA-SYS will activate REC-SYS with a goal of either ROO or RNO or RIO. Prior to this activation, three pre-requisite operations must be performed. First, a new chunk is prepared in STM, consisting solely of the Special type image element GOL. The LINK property of GOL is then set to an image body element within a currently attended STM chunk. Finally the PDIR (Prime DIRection) property of GOL is set to the direction perceived as being to the inside of the to be recognized object, given the image element of LINK of GOL as a reference position.

The image chunks are traversed by REC-SYS in an operationally cyclic manner, through means of the rules noted above. The condition "(#1:GOL)" attends to the specially prepared chunk, in which the object image structure being recognized is developed (constructed) as information is acquired from the relevant image chunks. This chunk is now accessible through the name #1:. The next condition, as can be seen in the appendix, checks on the name of the current goal..

Then, the condition "(*2: $1 (HAS (LINK OF GOL)))" locates and attends to the chunk in STM containing the image body element referenced by LINK of GOL. *2: will reference the entire chunk structure and $1 is set to that chunk's header element. If no such chunk is found in STM, rule REC15 extends the search to ITM and enters a copy of that chunk into STM for further processing in the next cycle, if such a chunk is found. If the chunk is not found in ITM either, then rule REC16 will fire, noting the forgetting of previously present image information, setting the LINK of GOL to UQX as will be discussed later.

Given the successful location and attendance of the desired image chunk, the condition part "(TYPE of $1)=??)", determining the type of image structure embodied by the attended chunk *2:, and the condition part "((TYPE of (LINK OF GOL))=??)", determining the type of image body element referenced within the chunk, are the only two pieces of information (symbols) necessary to activate the appropriate image traversing operation. ("??" is to be understood as a variable name.)

These intra-chunk traversing operations have several functions to perform. Given the image body element referenced and the presently perceived inside direction, (PDIR of GOL), these operations will add new object corner representations to chunk *1:, create new object side chunks, update the PDIR and LINK properties of GOL, and set positional and range or length values, all according to the information acquired through traversal of the *2: chunk.

Probably the most important function of each such operation, as far as object recognition is concerned, is the updating of the current recognition memory pointer (CRMP), which references nodes within recognition long term memory (RLTM). Upon initial activation of REC-SYS, CRMP is set to the base node RMN1 of the discrimination

net of RLTM. With the traversal o a perceived corner of the object to be recognized, the CRMP is updated to a new RLTM node according to the internal object angle at that corner.

Finally, when all relevant information in #2: has been utilized, the operation must set the LINK and PDIR properties of GOL in anticipation of the next process cycle. If an image body element is reached which references an image body element external to the present chunk upon the desired course of traversal, then the LINK property of GOL is set to reference that element, and the REC-SYS process will cycle and attend and traverse that chunk containing the newly referenced element.

If an element is reached which has the indication that no link is known in the desired course of traversal, or that the link prescribed is no longer in STM or ITM (has been forgotten), then the LINK property of GOL is set to UQX, indicating that only partial information is available relevant to this object recognition. Upon the next REC-SYS operation cycle, a rule will be fired (REC1, ROU1, RIC2) depending upon the goal specified) which examines the value of the UQX property of the current RLTM node referenced by CRMP. If the value is not NIL, then KO2 is proposed as the next active perceptual goal. The image model is completed in #1: for the suggested known object to guide AA-SYS operation upon the immediate deactivation of REC-SYS. If the UQX property is NIL, indicating that the present partial information is insufficient for such a proposal, the object model in #1: is left incomplete (REC1, ROU1) for AA-SYS to complete through further visual input with goal UO2 or to forget (RIC1). In all cases system control is returned to AA-SYS by REC-SYS process deactivation.

Upon the initial activation of REC-SYS, rule REC0 will fire, activating operation FRN, which upon constructing the first object corner sets property CA of GOL to the name

of the image angle element traversed. If traversal of an image chunk by a later REC-SYS cycle returns to that image body element, the LINK property of GOL is set to COM, indicating a complete object outline has been traversed and object image constructed. Upon the next REC-SYS cycle a rule will be fired (REC2, RIC1), which examines the COM property of the RLTM node referenced by CRNP. If that property is specified, then the name of the known object traversed is supplied to its image representation. If COM is unspecified, the object is only known (representable) as an N-SIDED object, N having been determined as NUMS (NUMber of Sides) is updated throughout the preceding image chunk traversals. Again, control is returned to AA-SYS upon the resulting immediate REC-SYS deactivation.

There are two circumstantial cases which will result in the traversal of only a partial or complete object model previously constructed in the special GOL-appended chunk during the activation of REC-SYS. The first such circumstance occurs when a previous REC-SYS activation has indicated that the partial information then available for object recognition did not indicate a known object goal. This result then prompted AA-SYS to obtain the visual information necessary to complete this unknown object's image representation. It is noted here that as further corners were "looked at" through utilization of the VI-SYS process and their representations assimilated into STM by AA-SYS, corner representations were added accordingly to the object model in the GOL-appended chunk. The internal angle values are not inserted into the object image, though, and must be accessed indirectly by attending to equivalently linked vertex chunks which are entered into STM. This is to prevent the system from constructing many cornered (sided) unknown object images. This illustrates the power of known object goals, as in accordance with a general protocol analysis indication.

Upon REC-SYS activation in such a circumstance, rule RUC4 will cyclically be fired, successively reviewing each object image corner and referencing the appropriate full vertex chunks as necessary to internalize the internal angle value code into the object representation. The rule also updates the CRMP location in RLTM according to these angle values as discussed earlier. Rule RUC5 is fired if one of these necessary full vertex representations is not available, having been forgotten (the resulting corrective action has not been inferred, a default deactivation of REC-SYS is the presently inplemented action).

Upon successful completion of this object review, the COM property of the node in RLTM referenced by CRMP is examined by one of three possible rule firings. Either a known object is recognized (RUC3), or an N-SIDED object (unknown name) is recognized (RUC2), or if the "eye" (CPP) is presently at a "T"-type vertex, that vertex is percieved to be on the side of a previously recognized object, and the present object is of unknown name after review, then rule RUC1, through function TFO, will reconsider the object image for possible recognition as an overlain known object.

The other circumstance which leads REC-SYS to traverse only a partial object representation in the GOL-appended chunk is that of re-recognition. This occurs when AA-SYS has found a previously determined known object goal to be inconsistent with newly acquired visual information (EXP has returned a NO after VI-SYS activation). Upon activation only one rule will be fired (either ROI1, ROK11, or RKI1), which need only traverse the now partial representation in the GOL-appended chunk (all angle codes are present) to determine any possible new object goal from the information present there.

Thus, as a conclusion and summary, the basic function of REC-SYS is to consider

(traverse) the image information residing in STM, to construct object models, partial or complete, based upon this information, and to determine object recognitions (namings) based upon the image information and the RLTM structure inferred for that situation and subject.

INC-SYS

The third, and last, supplementary process to be discussed is the incorporation process, INC-SYS. As noted in the preceding chapter and illustrated in Figure IV.1, this process is the only one capable of entering information into intermediate term memory, ITM, of the proposed perceptual system.

The basic unit of image information found in ITM is the image chunk as is found in the STM of the system. Thus, the function of INC-SYS can be simply stated as being the incorporation of copies of appropriate image chunks of STM into ITM, with the associated updating of the FIRST-ITM, LAST-ITM, FIRST-OB, LAST-OB reference pointers of ITM. These appropriate chunks are determined by INC-SYS through consideration of the current goal which is preset by AA-SYS prior to process activation and consideration of the current contents of both ITM and STM.

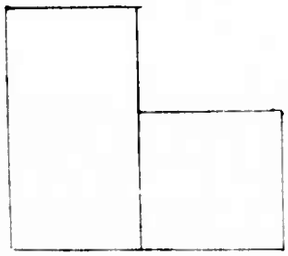
As can be seen in appendix A.INC-SYS, the implemented process consists of nineteen rules. This process, as with REC-SYS above, has been implemented as a union of those rules necessary to account for all of the chosen analyzed protocols. There are twelve rules (I21, I22, I01, I02, I011, I012, I0011, I0012, I0K1, I0K2, I0U1, I0U2) which may be fired to incorporate newly recognized objects and their immediate image environments into ITM. The conditions determining the rule to be fired are based upon the current goal and if ITM has any present image contents (the "(NULL ITM)" condition), as indicated by the rule titles.

The rules to incorporate objects utilize one main operation (either GOE, GOOE, or GOOEW) which incorporates a copy of the object image located in the GOL-appended chunk into ITM. Then the operation reviews that object, traversing the object structure, and incorporates a copy of any complex vertex or object side with which the object perceptually interracts by direct semantic links and which has not previously been entered into ITM. New links are created between the Chunk Header elements of the object and the environment chunks which indicate their interaction.

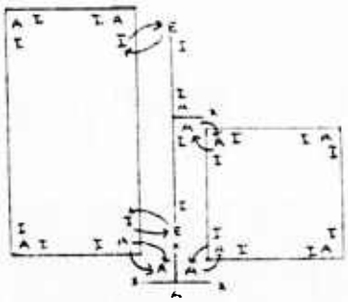
The special rule INCO will be fired upon the final INC-SYS activation. Its function is to remove any "T" type vertices that may be in ITM which occur at the flush meeting of two perceptually recognized objects. These objects are at that time perceptually linked through the addition of STIC property links (STraight Internal Continuation) to the appropriate constituent internal type image body elements. Figure II.1.1 illustrates this capability of INC-SYS in a pictorial form. The perception of picture (a) has resulted in the interim representation of (b) in ITM. The activity of INC-SYS, noting the existence of the TE (or "T") vertex interracting only with the two perceived objects, deletes the vertex chunk from ITM and links the INTERNAL elements as shown in (c).

Figure II.1.2 illustrates pictorially another similar capability of INC-SYS. The process notes the existence of two vertices (vertex chunks) which interract with two objects at the ends of equivalent object sides. This is demonstrated as picture (a) has resulted in the interim perception (b). The process eliminates the two vertices from ITM and links the appropriate INTERNAL elements by equivalency type EOI (Equivalent Object Internal) links. Simultaneously, the STIC links are provided for the bottom vertex, as shown in (c) of Figure II.1.2.

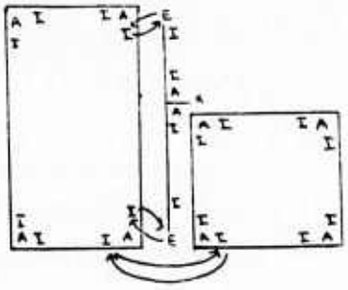
Figure II.1.1



(a)

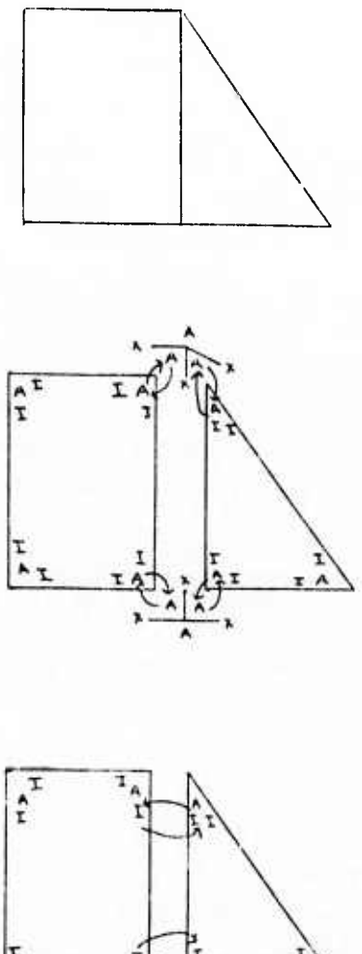


(b)



(c)

Figure II.1.2



The remaining six rules of the process (IICO1, IICO2, IIC1, IIC2, II01, II02) are utilized to incorporate copies of image chunks perceived as being either constituent to the outside line drawing boundary or a line or linking structure between such outside image chunks. The existence of inside and outside image chunks is due to the use of a strategy of perception differing from a strategy of just recognizing objects. The differing strategies will necessarily lead to different image representations for the same presented line drawing. The embodiment of these perceptual strategies is AA-SYS, to now be described in the second half of this chapter.

2. The Assimilation - Accomodation Process

GENERAL DESCRIPTION

AA-SYS is that process primarily responsible for the course of the development of the visual image representation of the externally presented picture, this image being the perception of that picture. To guide this development, which must of course react to inputs as discussed, the process uses a set of perceptual goals in a strategic role. An overall perceptual strategy is embodied by the set of goals utilized and the set of goal transitions (thus, possible goal sequences) embodied within (by) the assimilation-accomodation process. The current image memory of STM and the new visual information input can be understood to be the current tactical situation under the strategic umbrella of the current perceptual goal and its possible transitions.

The perceptual system as proposed is neither goal bound nor stimulus bound. The currently active goal determines what is of interest in the currently available contents of STM and the visual register and how this information is to be utilized. Thus, the

effect of any new stimulus information is tempered by this goal filter. But the stimulus does effect the system constantly, the main purpose of the system being to construct a representation of that environment through as continuous an assimilation of stimulus information as possible and the accomocation of memory as necessary. To again introduce the interpretation, the strategy (goals and transitions) must respond to any new tactical (visual image memory and inputs) situation or information, with that tactical situation being interpreted in terms of any current strategy.

In the perceptual system proposed, as embodied primarily in AA-SYS, there is no goal hierarchy or stacking of goals included. There is instead a goal network, with all goals at a comparable and equal hierarchy level. This network is defined in terms of possible active goals and the possible transitions between them. Illustrations of these follow as the specific implementations for AA-SYS are discussed next.

Though there is no explicit implementation of goal stacking or of any goal heirarchy, certain characteristics of the proposed processes serve the function of and elicit the behavior of such a goal structure. The use of a Special Type image element other than GOL (i.e. COM, LAST, OGOL) to facilitate the predetermined reconsideration of a previously constructed image chunk is an often used ability of VIPS which is usually associated with goal hierarchy.

The possible sequences of goal transitions undertaken in the recognition of an overlain object, in the situation where the proposed overlaying area has yet to be seen, can be understood as being a linearization of a goal hierarchy. The linearization is transparent in that each active goal in the sequence presides over a sub phase of necessary activity, thus providing a history of means to an end, which is another role (ability) of a complex goal heirarchy.

If the information does suggest a known object, this object's complete representation is constructed as (in) an STM chunk. This image is used as a source of visual register settings to propose expectations and to acquire the visual input for its confirmation. The current goal is then KO2 (Known Object 2-dimensions). (Note: Only implementation of two dimensional perception has been completely developed. A discussion of three-dimensional projection perceptions, with references to appropriate protocols, appears in Chapter 15.) If compatible information is found throughout the necessary visual input activations, the object chunk and any complex corners or outside sides in the object's direct environment are assimilated in STM. These are then entered into ITM by an INC-SYS activation. If incompatible information is discovered, the system must re-recognize, REC-SYS being activated with a goal of RKI (Recognize Known Interrupted), with either an object proposed or not. A TE ("T") vertex can yield an accomodating overlay hypothesis without REC-SYS activation.

If there is not sufficient information or appropriate information for REC-SYS to propose a known object goal, then more visual information must be acquired relevant to this object recognition. AA-SYS, under the goal UO2 (Unknown Object 2-dimensions), will obtain information through VI-SYS to complete the object's closed contour, and then activate REC-SYS with goal RUC (Recognize Unknown Completed) to either name the object or resort to an "N-sided" default. Then, directed by the completed image, the process will rescan the object, with goal K2C (Known 2-dimensional Confirm), before incorporating the object and its environment into ITM and proceeding to a new object. It is essentially this sequence, with other possible perturbations as seen later, that is cyclically repeated, until all of the external information (picture) has been represented in terms of objects, with any necessary interrelating sides and complex vertices. The picture is thus completely perceived.

The second implementation of AA-SYS (called RAAS) includes the first implementation and its strategy as a secondarily applicable approach. Initially, and primarily, the strategy of the second implementation is that of attempting to determine the whole external picture's outline (outside contour), and then subsequently interconnecting all inside directed links and recognizing any contained objects. This strategy defaults to that of the first implementation described above either when two successive internally directed vertex exits appear to possibly link, indicating one simple contained object which may easily be recognized, or when it becomes apparent, by forgetting, that the complete outline is too complex to remember.

With this strategy, the initial goal is SEO (SEarch Outside), which will lead AA-SYS to successively search and enter image representation chunks of vertices and lines that are constituent to the believed-to-be outside contour. Either the process will default to the strategy first discussed, or the process will note that it has returned to the initially seen vertex. Upon this occurrence, the perceptual goal will become alternatingly SIO and ICO, under which AA-SYS will utilize its existing memory representation to rescan the external picture, confirming its representation and incorporating the constituent outline chunks into ITM as it proceeds. Failure in this rescan will result in a default to the previous RAA strategy of successive object recognitions.

Given a successful outline confirmation, the process will begin on the task of interrelating (interconnecting) all of the internally directed exits which are left unknown when determining the overall picture outline. The goal SIL traverses the outside again, noting each inside exit in terms of its direction and its spatial relation to other known inside exits to determine possible line segment linkages. When a

possibility exists, the goal LOO (Link Outside to Outside) becomes active and movement goes to the inside of the picture along the possible linking line. Whenever such a proposal succeeds, REC-SYS is activated with goal RIO (Recognize Inside Object) to determine if an object has been now outlined, and if so, to recognize it. If the proposed link fails, then an inside vertex has been "seen" and is entered into STM. An attempt to link it with a known internally directed exit of the outline is carried out with active goal LIO (Link Inside to Outside).

As before, such attempts continue until no internal links from the picture outline or internal chunk exits are left unknown, indicating that the picture perception is complete. The perceptual description here usually is a combination of objects, which were noted by the inside object activations of REC-SYS, in conjunction with various line and vertex chunks of and inside of the perceived picture outline.

THE TWO IMPLEMENTATIONS

RAA

The RAA implementation of AA-SYS consists of over eighty rules, as listed in appendix A.RAA. The partioning of this production system by perceptual goals makes the task of understanding such a large process feasible. The value of this partitioning for understanding lies in the fact that once one grasps the overall intergoal control structure embodied by an implementation, one need only then consider a relatively small, and understandable, set of rules within each goal at one time. This same characteristic of the partitioning is similarly valuable for system development, alteration, and operation.

Figure. II.1.3(a) is a diagrammatic representation of the primary overall goal flow utilized in the RAA implementation. Some of the less important goals and their transitions have not been shown to yield a more understandable diagram. Each node of the diagram indicates a perceptual goal. (Note: Some goals are active during associated REC-SYS and INC-SYS activations by AA-SYS). Figure II.1.3(b) provides a list of expansions for the mnemonic goal names. Tno diagram is presented to save numerous circular courses of inconceivable prose, and thus will not be supplemented with any verbiage here. In the discussion above, an overall description of the approach was given. The discussion will now proceed with considerations of each of the rules partitions, which, together with the overall goal structure of the diagram, will complete the description.

The main function of any active perceptual goal is to specify what information currently in any of the accessible memories is of interest. The possible values which these interesting memory nodes may have then is instrumental in determining the rules necessary, both in terms of conditions and actions. The number of rules generated for eny perceptual goal depends upon the number of memory elements that are of interest and upon how many velues those elements may assume. With this in mind, each group of rules will be briefly discussed in terms of their conditional element constituents (in terms of what the rules consider to be of interest) and consideration by the reader of the annotated appendix should yield understanding. The title of each rule indicates the general condition which will cause it to fire. One is reminded that the implemented production system is ordered. This ordering is specified at the head of the production system listing. Following the process listing is a list of expansions for the various mnemonic condition and action operation names. The first rule within the active goal's partition which has all of its condition parts satisfied is the one which fires.

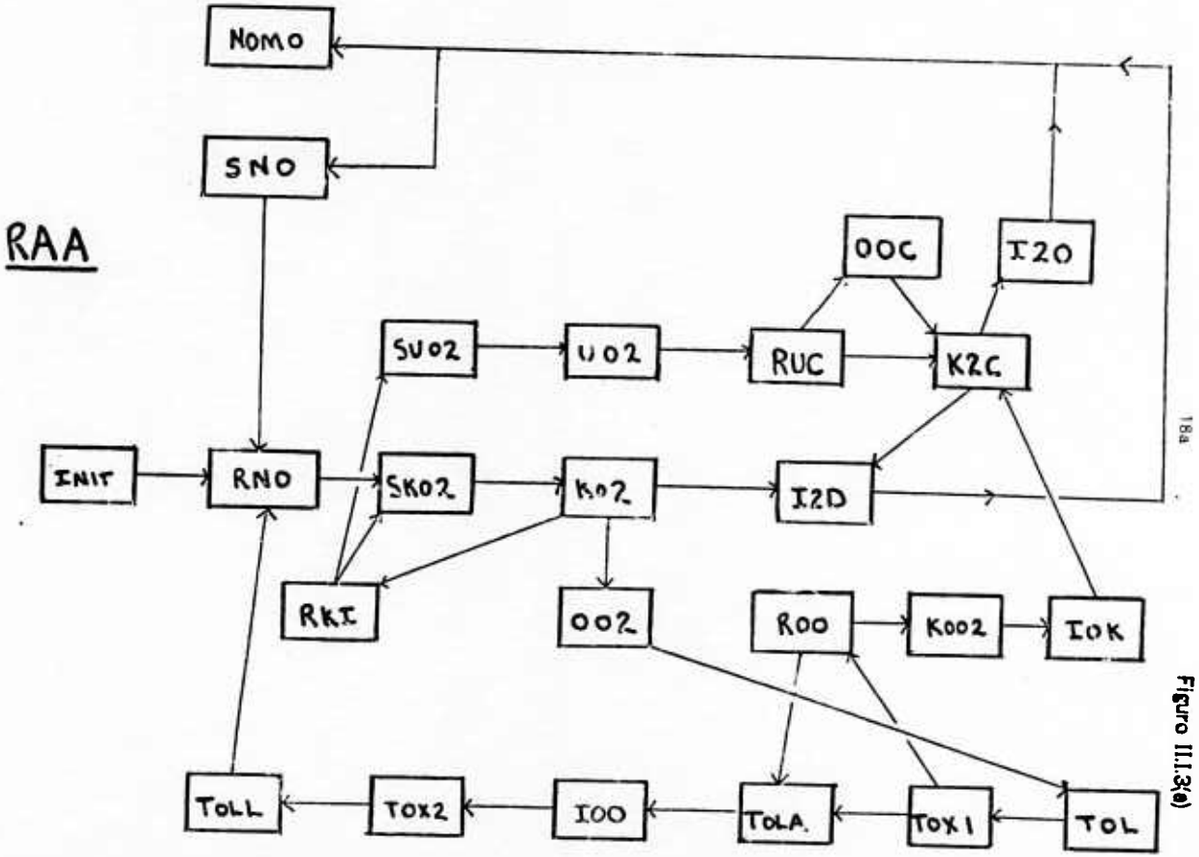


Figure II.1.3(a)

Figure II.I.3(b)

RAA

RNO - Recognize New Object
SUO2 - Start Unknown Object 2-dimensions
SKO2 - Start Known Object 2-dimensions
UO2 - Unknown Object 2-dimensions
KO2 - Known Object 2-dimensions
RUC - Recognize Unknown Completed
OOC - Overlay Object Confirm
K2C - Known 2-dimensions Confirm
I2D - Incorporate 2-Dimensional object
I2O - Incorporate 2-Dimensional object Overlain
NOMO - NO Move Objects
SNO - Start New Object
RKI - Recognize Knwon Interrupted
OO2 - Overlain Object 2-dimensions
TOL - Traverse Overlaying Line
ROO - Recognize Overlaying Object
KOO2 - Known Overlaying Object 2-dimensions
IOK - Incorporate Overlain Knowing overlaying
TOX1 - Traverse to Overlaying XIT 1
TOLA - Traverse Overlaying Line Again
IOO - Incorporate Overlain Object
TOX2 - Traverse to Overlaying XIT 2
TOLL - Traverse Overlaying Line Last

When the perceptual goal is K02, both EXP and ATT are specified by AA-SYS, prior to VI-SYS activation. EXP is specified in terms of an angle code; ATT is specified in terms of a direction perpendicular to the DIR specification (the ATT direction being to the inside of the object during the movement). The proposed object image which is pre-constructed in STM is the source for these values. The specification of ATT allows the resulting image chunk in VI to be of type VERTEX or type LINE (with QUICKSEE elements on the side opposite ATT). EXP may be returned with a value of YES, NO, or CON after VI-SYS activation.

The rules associated with K02 (K021, K022, K023, K024, K025, K026, K027, K028, K029, K0210, K0211, K0212) are primarily concerned with these resulting values (the TYPE of VI and EXP) in their condition parts. The condition parts also consider whether the whole object image has yet been confirmed by visual search and whether overlay may be the cause of an EXP value of NO , this possibility indicated by a "T" vertex.

When the goal is K2C, both EXP and ATT are specified in terms the same as with K02. The rules associated with K2C (K2C1, K2C2,.., K2C11, K2C12) are concerned with the comparison of the results of the VI-SYS activation (specifically, the value of EXP and type of VI) with the corresponding information elements of the object image within STM. If EXP is CON or the TYPE of VI is LINE , only the type of an image body element indicative of an expected complex side or vertex is checked . The exact correspondence of that side or vertex to the new input is not checked . This avoids chunk and complete VI attendance.

When the goal is O02, again both EXP and ATT are specified in the same terms. O02 is in one sense a combination of the two previous goals in that the object is

partially retraced, as with K2C, and then new picture areas are searched according to the preconstructed object image model, as with K02. The condition for completion of the object scanning differs, this being a complex vertex which appears to link up with the previously seen TE vertex, which was then the source of the overlay idea. The rules (0021, 0022,..., 00212, 0021[illegible]) embody these decisions.

When the active goal is U02, only DIR is specified prior to VI-SYS activation. Thus, VI will contain an image representation of that vertex next located in the DIR direction. The rules (U021, U022, U023, ..., U028) associated with this goal are primarily concerned with whether a complete object outline has yet been scanned, whether the inside angle of the newly seen vertex is straight (STA ~ 180 degrees), and whether an outside side is currently incomplete and as such is under construction.

These four goals above form the heart of the RAA implementation. The goals to next be discussed are goals which can occur subsequent to the 002 goal, and are concerned with guaranteeing that indeed there is a possible object capable of doing the proposed overlaying. This guarantee is accomplished by either noting the existence of a large enough enclosed area for overlaying, or actually recognizing that overlaying object. This is illustrated by the Figure II.1.3(a), which shows the possible transitions to TOL, TOX1, TOLA, TOX2, TOLL, and K002. This section of the goal transition network represents the linearization of a sub-goal hierarchy as noted earlier.

Goal TOL is concerned with initially establishing the overlaying line. As such, the rule firing is conditioned upon recalling the previously seen TE vertex, and then upon encountering a suitable vertex for enclosing an overlay area. Four rules (TOL1, TOL2, TOL3, TOL4) are associated.

Goal TOX1 is active following TOL. The condition parts of its rules (TOX11, TOX12, TOX13, TOX14, TOX15) consider whether the extent of the move (thus, the enclosed area) is sufficient for overlay. Rules TOX1 and TOX2 consider whether a simple (V2) vertex is encountered, which prompts an attempt to recognize the overlaying object (goal KOO2 activated). TOLA utilizes three rules to retraverse the overlaying line and again visually search to confirm the overlaying capability of the adjacent area to the overlain object just recognized by activity with goal OO2.

The rules for TOX2 check whether the move is sufficient to guarantee an overlaying area and, dependent upon whether the search has yielded a simple vertex or not, decide whether to start a new object recognition there. If not, goal TOLL repositions the perceiver (CPP) on the overlaying line to begin a new object recognition. As such it is similar to K2C, in that it operates with EXP and ATT specified, retraversing a previously seen line which already has an image representation existing in STM.

There are two goals, KOO2 and UOO2, which may become active following TOX1. If TOX1 finds a simple V2 vertex, REC-SYS is activated to determine if an overlaying object is suggested. If so, KOO2 will become active. Its rules are identical to KO2, indeed sharing some, in terms of considerations taken in the condition parts. It varies from those of KO2 (rules KOO23, KOO24, KOO25, KOO26) when either the object is interrupted or completed in its action part. If KOO2 is interrupted, UOO2 may become the current perceptual goal. Likewise, UOO2 shares some of the rules of UO2, differing in action when the object outline has been completed.

There are a final set of goals (SK02, SU02, SUOO2, SKOO2, SOOC, SK2C) which are goals manufactured by REC-SYS to communicate to AA-SYS the results of its actions.

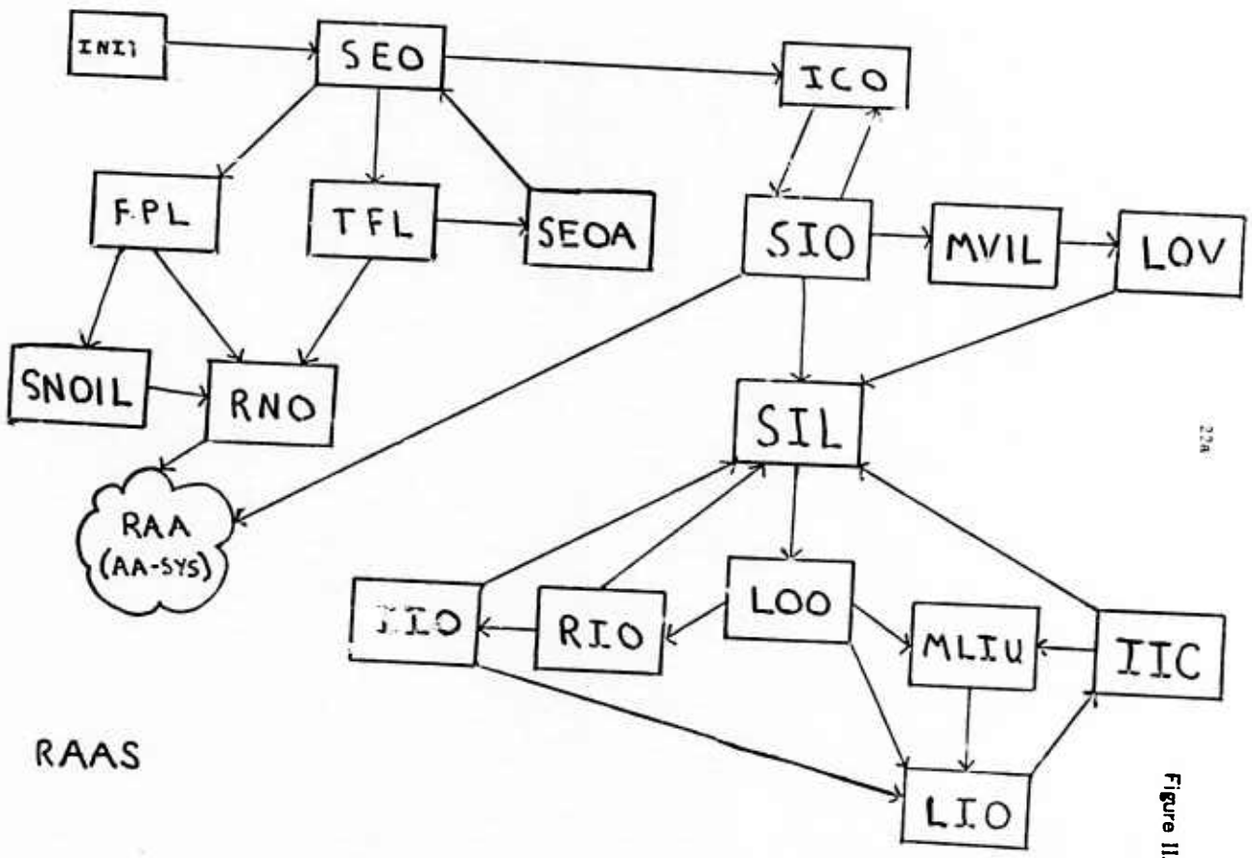
Each such goal has only one associated rule, which sets the visual register and activates VI-SYS, while also altering the goal to one previously discussed (without the initial S). The goals SNO and NOMO are indications from INC-SYS [illegible] actions. They act as a signal to either start new object recognition at a noted place, or that no more objects are to be found and that picture perception is complete.

The reader with further interest is reminded to study the annotated appendix A.RAA. The description here is meant only as a brief guide to introduce the contents of the appendix.

RAAS

The goal control structure for this implemented strategy is illustrated in Diagram II.1.4(a), with the mnemonics expanded in Figure II.1.4(b). A short verbal description of this strategy has been given previously. As with RAA, a brief discussion of the rules for each goal will be undertaken here.

The rules associated with the goal SEO (being SEO1, SEO2, ..., SEO7, SEO8) are primarily concerned with assimilating image chunks which represent the outside picture contour. As such, it must decide if it can start an outside line, due to a straight angle on the outside of the newly seen vertex), whether it has previously started such a line, and whether it has yet returned to the beginning vertex, having completely circuited the picture outline. The rules also contain condition parts which check to see if a possible connection of successive inside directed links is suggested by new and previously entered STM image information. Goal TFL or FPL may accordingly become active , further leading to to RNO activation and defaulting thereafter to the strategy of RAA.



RAAS

Figure II.1.4(a)

Figure II.1.4(a)

Figure II.1.4(b)

RAAS

SEO - Search External Outline
FPL - Finish Proposed Line
TFL - Try For Link
SEOA - Search External Outline Again
RNO - Recognize New Object
SNOIL- Start New Object on Inside Line
ICO - Incorporate Chunk Outside
SIO - Search to Incorporate Outside
MVIL - MoVe to Inside Link
LOV - Link Outside Vertex
SIL - Search for Inside Link
IIO - Incorporate Inside Object
RIO - Recognize Inside Object
LOO - Link Outside to Outside
MLIU - Move to Link Inside Unknown
IIC - Incorporate Inside Chunk
LIO - Link Inside to Outside

The rules for the goals TP1 and TP2 are concerned with whether this suggested link can indeed be realized. Their condition parts consider whether expectations have been met, or if not, whether the chance for the link still exists through a line construction which can assimilate the intermediate, but unexpected, vertex encountered.

The rules of SIO (SIO1, SIO2, SIO3, SIO4) are concerned with whether the view expected during the outline review has been indeed encountered. The rules of CO (CO1)A, (CO1), (CO2) provide the expectations prior to V-SYS activation. The action halves also take note of any unknown inside directed exits by creating an IXL (inside eXit List) as a property of SX1.

The rules of MVIL (MVIL1, MVIL2, MVIL4) are similar in purpose to a combination of those for SIO and CO. These rules are concerned with retraversing the outline to reach a vertex which has an inside directed link of interest. The rules thus check expectation satisfaction, check if the vertex of interest has been reached, and provide new expectations before re-activating V-SYS, if that vertex has not been reached. The rules associated with LOV (LOV1, LOV2, LOV3) check to see if that unknown inside directed link of the busy vertex can indeed be interrelated with another unknown inside link.

The goal SIL has nine rules associated with it (SIL1, SIL2, ..., SIL8, SIL9). These rules check to see if a presently viewed vertex of the outside contour has an unknown internally directed link which offers linking possibilities to another unknown link. It provides expectations either for further outside traversal or attempted internal linking, as the condition directs.

The rules associated with LIO (LIO1, ..., LIO7) are concerned with whether new

visual information has inter-linked, or still leaves the possibility for linking, two previously unrelated and unknown internally directed links of the outside contour. The rules of LIO (LIO1, ..., LIO4) do similarly for links between an unknown from the outside contour and one from a chunk perceived as being within that outside contour.

The rules for goals SNOIL and MLIU are similar in function and thus construction to those of MVIL. Expectations are checked and subsequently provided until the desired location within the picture is reached.

The following chapter will give examples of each of the implemented versions in action upon two pictures. A comparison will be made between the action trace of the

K02

Chapter II.2 ..... Protocol - Program Trace Comparisons and Evaluation

K02

1. Comparisons

SN0

The comparison of subject behavior to corresponding program activity is carried out at differing levels of completeness. The difference lies in the depth to which program activity is presented. Four protocol-vs-program activity comparisons are presented. These four presentations represent the activity of the two perceptual strategies inferred from the protocols at work on two line drawing environments. Each section of the chapter is labelled with the name of the appendix it references. Each section begins with a discussion concerning how to comprehend the format of the referenced appendix. A final, comprehensive evaluation section follows these four separate considerations.

U02

A.P1

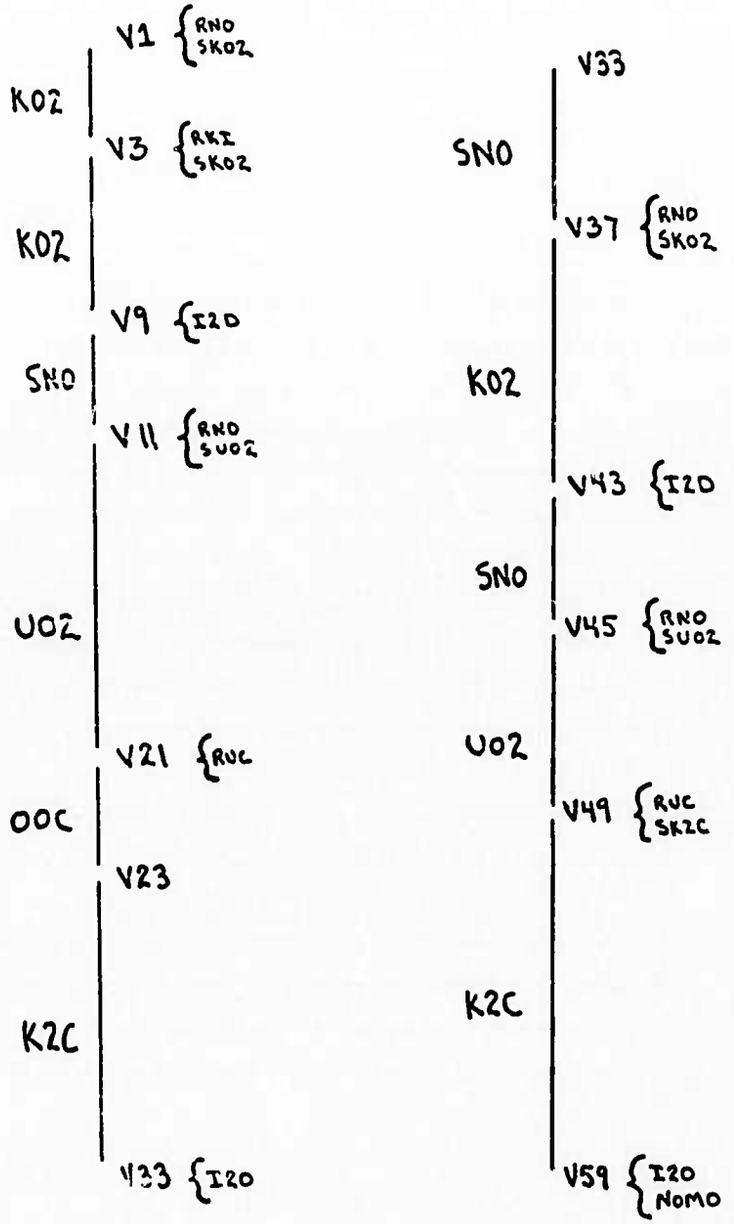
00C

Figure II.II.1 presents the goal episode chart for this protocol - program trace The initial section of this comparison appears in Chapter I.4. That section ended with the incorporation of the triangle in the lower left (protocol frame V9).

The incorporation process also determines where to begin new object recognition, if unknown picture areas still exist. As the rule is traversing the object image to incorporate any interacting environment, it notes the first unknown link in an

K2C

Figure II.II.1



interracting chunk. That chunk is marked with LAST as seen in STM "16,0". Rule SN00, fired upon return to AA-SYS, immediately sets the current picture pointer (CPP) to the corresponding external picture location. This VIPS convention avoids the implementation of a planning phase to determine the shortest route to the starting location. This creates a consistent variance from subject behavior, which is evaluated later.

At frame V11, by statement [S15], the subject indicates that he can not determine an object goal from the initially available information. This is further confirmod in statements [S16] through [S21] of frame V13, which also indicate that, though no object is hypotesized, the new information is still being acquired for the purpose of future object recognition.

Correspondingly, REC-SYS is fired with goal of RNO, which is active for several cycles, constructing 065(a) and then 065(b). The second corner entered in 065(b) is not fully specified. The QUICKSEE element of L37 only allows a "skeleton" corner configuration to be constructed. Next, rule REC1 fires and finds that the UQX value of CRMP is null. Thus, no object is suggested. AA-SYS can only specify DIR to VI-SYS, 065 being an incomplete, unknown object image. With goal type U02 active, AA-SYS searches the picture to complete the object image outline, at which time another activation of REC-SYS will be applied to achieve recognition. As the search proceeds corner configurations are added to the incomplete OBJECT chunk (065 (c), (d), (e)) and image chunks are entered for every vertex at a corner of the object. The angle codes of the ANGLE elements at the new object corners are not directly integrated into the object structure. They are represented in the ANGLE elements of associated vertex chunks. This limits the number of sides for an unknown object, as the vertex chunks

must be maintained in STM for later angle code retrieval. A SIDE chunk is entered into STM (S101), due to the encountering of a straight angle on the perceived inside object direction (PDIR of GOL). Since ATT is not specified, movement is not through the vertex. The full corner representation is realized, as shown in S101(a) and (b). Without ATT being specified, the first vertex in the DIP direction becomes represented in V1. AA-SYS here transforms this vertex information into a SIDE chunk image (S101(a)), accomodating the visual input in light of the current object related goal UO2.

Corespondingly, this search continues until frame V21 of the protocol (p. 22 of the appendix). At protocol frame V21, the subject knows that he is at the unknown vertex on the previously seen triangle's side (statement [S23]). He thinks about what is known (statement [S24]) and recognizes an object, an overlain square, for confirmation (statements [S25] and [S26]).

The system likewise notes it is at the location on L37, and completes that specification, as shown in L37(c). REC-SYS is then activated and considers the unknown object image AA-SYS has constructed (O65(f)). It incorporates the equivalent angle codes into the image and traverses CRMP through RLTM by a succession of RUC4 rule firings, as previously discussed. As this is completed, rule RUC1 is fired, noting that the object has no known name but that it intersects a previously perceived object's side at a "T" vertex. This rule rescans the object image, determining that it could be an overlain square and altering the image to O65(g). REC-SYS deactivates with the goal set to SOOC.

AA-SYS then specifies the visual register to begin confirmation. Here an example is given of EXP specification when ATT is not specified. The whole vertex configuration (vertex 3) is expected, and only YES or NO may be returned after V1-SYS activation. As the trace indicates, the expected vertex is seen (EXP is YES).

There follows a protocol sequence of hole-movements to confirm the overlain square goal. The system does likewise (goal K2C), marking each vertex as confirmed when passed, and utilizing the object image to provide EXP and ATT specifications. Statements [S27] and [S28] indicate that this is also the subject's activity at this time. The subject moves the hole at a faster rate, also inferentially indicating a review. Information assimilation during the rescan consists of marking as confirmed elements of the object image. At frame V33 the confirmation is complete and as indicated by [S29], the subject makes two movements to reach the desired location to commence a new object recognition.

The corresponding system trace indicates that rule K2C3 is fired, noting overlain object confirmation is completed, due to again encountering the TE (cutting off) vertex. INC-SYS is activated to incorporate the object and environment into ITM, as shown on the next page of the appendix. This incorporation rule again chooses the location to begin new object recognition, and upon return to AA-SYS, CPP is positioned at the appropriate vertex of the picture.

In frame V37 the subject notes that he is starting a new object at that location. Correspondingly, AA-SYS activates REC-SYS, with goal RNO, having provided the special GOL chunk and LAST marked chunk. Memory is traversed by rules REC0, REC11 and REC3, constructing 0184(a) then 0184(b). The UQX property of CRMP indicates that this is sufficient information to suggest a square or rectangle perception, and this image is completed by rule REC0 in STM 56,0 and shown as 0184(c). Upon deactivation, AA-SYS sets the visual register utilizing the proposed object image and activates VI-SYS. The goal becomes K02. There follows a sequence of three movements to confirm the object. The complex vertex V205 is incorporated by AA-SYS, due to the returned CON value of EXP.

The subject undertakes identical hole movements, but has not mentioned the square or rectangle prooosal which the system has assumed. At frame V43 the subject notes the rectangle recognition ([S31]) and its relationship to past known picture parts ([S32] and [S33]). In frame V44 he moves to start a new object recognition. That the subject does not rescan the new object is inferential evidence of the prior square or rectangle proposal (goal K02). Consistently, the subject will rescan an object which has required a prior complete scan for recognition (goal U02).

At this time the system likewise notes that the proposed object image has been completely marked as confirmed. INC-SYS is activated to again enter the new object and any interracting environment into ITM. The rule I22 also chooses the new object start location, with the AA-SYS rule SN00 updating the CPP location accordingly upon INC-SYS deactivation.

The subject does not voice a goal at V45, but merely begins the search for new visual information. At this point, the system activates REC-SYS again, through a goal of RNO. There follows a memory traversal, involving the recall into STM of the initial triangle and the vertex interracting with its top point from ITM. The partial image O224(c) is the result of this memory scan, with the UQX value of CRMP indicating that this does not suggest any known object.

Thus, the resulting stategy (goal U02) is to search for information relevant to the object recognition. The chunk for V48 is marked with special element COM, being the chunk representing the vertex to be seen as an indication that such image has been completed by the subsequent visual (holo) search (see STM listing 75,0). During the initial REC-SYS memory traversal ch attempts object recognition, a new side chunk(S228) has been constructed. This is a side-effect of the traversal, as the image

information which is traversed (remembered) is not just retrieved, but is considered in terms of the new object image being constructed, and altered (accomodated) as such. Note that in the STM display 75,0 vertex chunk V205 is the last element chunk. Since this chunk is necessary for correct future system processing, VIPS, with the processes as now implemented, requires a minimum of nine STM chunks.

At V49 the subject realizes that he has seen the whole object outline. This can be inferred from [S35] and [S36] of the next two frames, which indicate directly that he can only name it by default as being a four-sided object. At the corresponding point, the program trace indicates that AA-SYS realizes the complete outline has been seen, also. REC-SYS reviews the object image through a succession of RUC4 rule firings during a REC-SYS activation. It defaults also to a four-sided name and returns control to AA-SYS to begin confirmation. 0224(e) is the object's final representation.

The subject continues to review the object through frame V59. At which time he notes he has completed the rescan [S39] and that there are no more objects to the picture and he will provide a description [S40]. The program similarly rescans the object image. Upon return to the vertex shown in V59, the system realizes it has completely marked the object image as confirmed. It activates INC-SYS, with rule I22 updating ITM appropriately. The rule I22 also notes that no environment of the object is unknown. Upon return to AA-SYS, rule SN0000 is fired, which reactivates INC-SYS to finalize the picture representation by eliminating TE vertices between objects.

Upon deactivation of INC-SYS, NOMO1 of AA-SYS fires, listing the names of the objects found as a special verbalization selection. The subject's picture description is given. He similarly notes the objects in the order of their incorporation, also describing certain characteristics of their interactions. These interactions are included

in the final ITM representation which the system has constructed. Three representations in print form are given for the final ITM contents of the program. The short version lists only chunk headers; the medium version lists chunk headers and a list of other elements; the full version lists every element with all of its associated properties. In the pictorial representation, the eight final chunks are shown, with interrelating links drawn.

A note here toward the final evaluation section. The programmed system moves the same as the subject, except to reach a new object start location, which is done in one jump. It proposes object ideas as the subject does, only noting the rectangle recognition goal prior to the subject. Viewing the verbalization of description as a selection of information from ITM, the system has constructed information sufficient to elicit the response of the subject in a straightforward manner. Indeed, the superficial description by VIPS bears correspondence to the subject's verbalization. The further specifications given by the subject to clarify the spatial interractions between the four perceived objects are all directly represented or easily derivable from the final system ITM representation.

A.S1

In this discussion, the action of the RAAS version of AA-SYS, inferred from a different subject upon the same picture as just discussed will be considered. The flexibility of the visual image representation is illustrated. It will also demonstrate the influence of perceptual goals upon the processing activity and resulting perception.

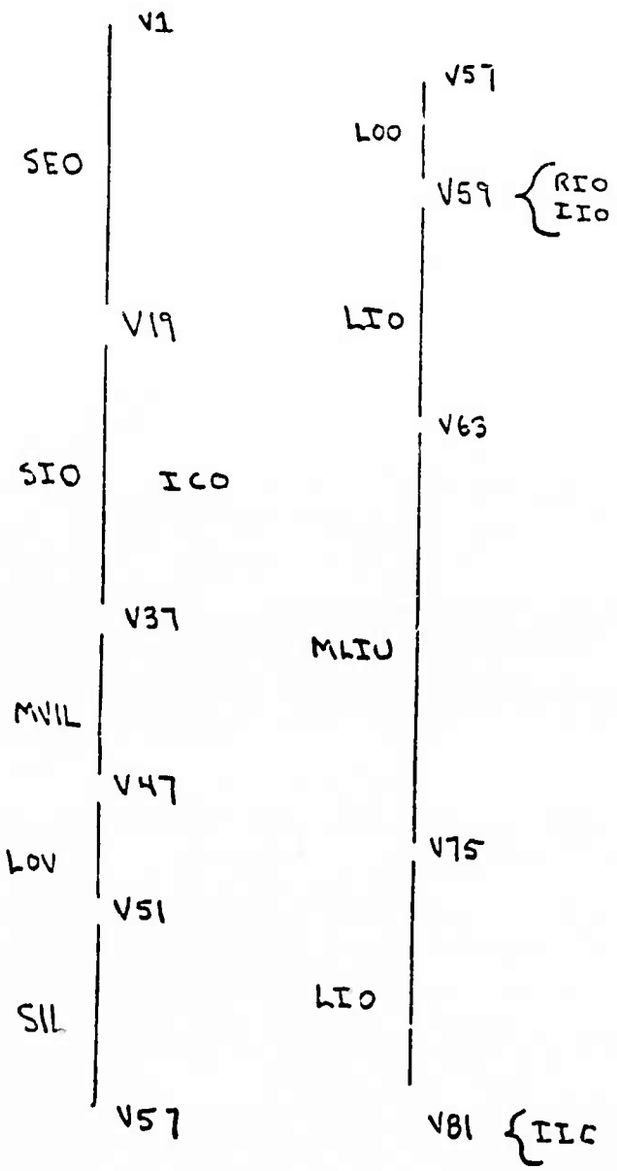
Appendix A.S1 presents a more concise display of program activity than does A.P1. In this appendix the protocol segments are interleaved with the names of the rules

correspondingly fired in AA-SYS, REC-SYS or INC-SYS. Also in the interleaving are included pictorial representations of any chunks entered, created, or altered in STM by the rules listed. The values of the visual register are not displayed. These values will be discussed in the text to follow, with special consideration given to any segment where the protocol and program differ in the movements chosen. Figure II.II.2 is the graphical representation of the behavior to be discussed in terms of goal determined and directed sub-sequences or episodes. Transitional frames of the protocol are noted, and will be considered in the following. Appendix A.S1 is not included in this report but is available from the author.

The strategy associated with the initial goal (SE0) is to do a complete scan of the picture outline. The initial chunk incorporated is marked by the appended GOL element. Consider the first sub-sequence of eye-hole movements, frames V1 to V19. With each new view the appropriate rule is fired to incorporate the new information into STM. This may involve the entering just of the newly seen vertex or may involve the construction of a line chunk as the input and goal direct. The next direction of move is determined by traversing the newly incorporated chunk in the course (direction) believed to be to the outside. The outside direction is updated at that time (PDIR of GOL) and DIR is specified according to the chunk exit thus reached. This is a prime example of perceptual activity being strategy bound at the top level, yet stimulus bound at the tactical level. The subject is correspondingly just noting the vertices encountered. Indications of existent line concepts (statements [S7], [S10]) correspond with the corresponding LINE chunk constructions by VIPS.

In correspondence to the statements [S32] and [S34], the system fires rule SE01 which notes that the vertex represented in the GOL appended chunk has been

Figure II.II.2



reencountered. This indicates that the outside circuit has been completed. This outside contour has been represented in seven STM chunks, fitting within the nine utilized in the proposed system.

The next episode sequence (to V37) consists of alternately incorporating a reviewed chunk into ITM under rule IC0, and moving around the outside with EXP and ATT set according to the next chunk in the outside contour with rule SI0 active. In this sequence both the subject protocol and program trace indicate that expectations are consistently satisfied throughout this reviewing rescan. No new chunks are created in STM throughout this rescan. A shuttling of the order of chunks within STM, as each chunk is rescanned and a copy of it is entered into ITM, is all that occurs. EXP consistently returns YES or CON as expected.

In accordance with the statement [S39] at the V37 frame of the protocol, rule SI01 is fired indicating the rescan has been completed successfully. Throughout that rescan any inside directed links were noted, and entered into a property list of GOL named IXL. Also the vertex representation V4 was noted as IXV of GOL, being a vertex (the first occurring) of the outside contour having an inside directed unknown exit. These inside directed exits have been starred (*) in the pictorial versions of the chunks in the appendix. The fact that IXV of GOL is not null but references V4, results in the next goal of MVIL, which presides over the next episode sequence (until frame V47). Throughout this episode, chunks are merely retraversed, with EXP and ATT specified according to known chunks until the external equivalent of vertex V4 is reencountered in the eye-hole (CPP). No chunks are entered into STM, only the reshuttling again as chunks are rehearsed and rescanned.

At frame V47 the subject pauses, moves internally to vertex labelled 7, then

returns to vertex 6, which is V4 in STM. The AA-SYS rules which fire at a point corresponding to V47 indicate the system determines that it has reached the "busy" vertex, and moves inward with goal LOV to attempt to link it to another unknown, inside directed exit. V8 is entered into STM as no correspondence can be seen between that newly seen vertex and any of the specifications of the unknown exits of IXL of GOL. As such, VIPS returns to vertex 6 (chunk V4), and AA-SYS activates a new goal, SIL (Search for Inside Link).

This goal directs the next movement episode from V51 to V57. The strategy of this goal is to scan the outside contour, providing EXP accordingly and with ATT begin specified to the perceived inside direction, until an opportunity presents itself to attempt (hypothesize) an internally directed link. This opportunity, as the subject notes in statements [S52] and [S53], is present at V57. This opportunity is also noted by the program, with SIL1 firing, noting the possible linking to the exit available on L2 (in the protocol appendix note the exit on the pictorial representation which has been starred (*)). This goal is set to be LOO and EXP is set according to that possible link up.

A note is made here concerning how this possible linking opportunity is realized by the implemented system, as it occurs at further occassions in this and in other protocols. The system considers the current unknown vertex exit in terms of its perceived location and its direction. A function searches the list IXL of GOL of unknown linking exits attempting to find one of the opposite direction. If this succeds a check is made to see if the links are then in the proper spatial relationship by comparing their perceived locations. In the example here the exit of line L2 is opposite in direction, and it is up and left of the currently seen exit, as it must be to

possibly link. The L2 line chunk has the COM special element accordingly appended to it by AA-SYS. The CR property of its header element is set to reference the unlinked XIT element, and EXP is set in anticipation of that view.

At frame V59 of the protocol, the subject indicates that he is satisfied with that link existing to the line chunk, as statements [S54] and [S55] uphold. The subject does not continue pursuing this link confirmation, due to the fact that an opportunity to link the new inside vertex to the line at the top (L3) is noted, as inferred from statements [S58] and [S59].

The program likewise notes the new linking possibility. The program also accepts the link from line L7 to line L2 as being confirmed, and as such activates REC-SYS to determine if any contained object has been outlined. Under goal RIO, REC-SYS traverses the appropriate STM chunks, constructing a complete and recognized triangle image. INC-SYS is activated with goal IIO to incorporate the triangle and L10(b) which is a side of its immediate environment. Finally the goal LIO is set to attempt to confirm the link to line L3, EXP being set accordingly.

This goal is in control through V63. At frame V61 the subject expects to hit the top line, but fails. This monentarily confuses him, but he continues up the vertical he has started to see if the goal can be realized. This idea is upheld by statements [S64] and [S65] indicating the expectation, and by the fact that he does not realize he is at the view corresponding to vertex V8 (still in STM) when at V61.The linking goal (LIO) causes different considerations of the input. The system does likewise. Noting the existence of a straight side to the vertex encountered at V61, rule LI03 is fired to begin the construction of line L12 and continue to move upward for the desired link. This link is realized as EXP is YES and line L12 is completed, linking to the inside link of L3.

The next goal to control an episode of action is then MLIU, which realizes it has an unknown link on the line L12 just completed, and must eliminate that link. Here the program and protocol part company for a set of moves. The program (AA-SYS) directly returns down to the vertex labelled 7, nowrepresented as part of line L12. The subject protocol indicates a sequence of moves, with expectations being satisfied, which does in fact return to the vertex labelled 7. It is proposed that the parting of the ways is only in the sequence of moves chosen, not in strategic purpose.

At frame V75, the subject notes the possibility of linking the vertex seen, and remembered as part of the vertical line (see [S74]), with the vertex V4 which still has the unknown inside directed exit. This is noted in the hurried statements [S76] and [S77]. The move is made to confirm this expectation with success. The system does likewise, as rule MLUI1 notes the possible link and sets the goal to LIO. LI02 fires when EXP returns YES, linking the inside line to vertex V4. As the line is completely linked now spatially, it is entered into ITM through an INC-SYS activation with goal IIC.

As each inside directed link of the outside is searched and linked to other chunks, it is eliminated from the IXL property list of GOL. With the removal of the link of vertex V4, IXL becomes empty, and rule SILO fires, noting that all links are known and the complete picture perception has been realized. Similarly in V83, undertaking one extra move, possibly to further confirm that last link to the outside, the subject indicates his task completion with statement [S81].

In comparing the pictorial representation of the final ITM contents developed by the program to the final verbal description produced by the subject, one finds that adequate information, in terms of very similar visual concepts is present in ITM. A description output algorithm which first lists any perceived objects and then verbalizes

while traversing the remaining line and vertex chunks not related by equivalence to those objects would produce a description from these final ITM contents which would be very similar to that given by subject (see Chapter I.3, The Image in VIPS.).

In looking ahead to the evaluation section, the program generates ideas concerning completion of the outside and possible inside links at points correspondingly equivalent to the subject. The subject never mentions the triangle until the final description. The program forms the object image at the point when the inside link creating it is accepted. The subject and protocol do part ways for a time, but the path reintersects at the important point when a new link idea emerges. If one accepts that the movements leading to that point were under the goal of getting to that possible linking point, then the only difference between protocol and program is the chosen path. The final subject and program descriptions share a very close relationship. The reader is prompted to note the difference between subject and program descriptions and representations of this appendix and the previous appendix A.P1. This is a fine example of the flexibility of the image representation of the thesis and a fine example of the effect of overall perceptual strategy upon the resulting perception.

The discussion now turns to two further protocol studies of another picture with the two differing strategies represented again. Both discussions and the appendices that they will reference are of a similar format, which will now be clarified before proceeding. The format of the referenced appendix is basically the subject protocol interleaved with pages of pictorial representations of the image chunks being produced by the implemented system's activity. When the entering, creating, or altering of an image chunk can be put in direct correspondence to the inferred activity at a protocol frame, that frame number is noted in parentheses next to the image chunk name. The

discussions are in terms of active goal episodes, utilizing the active goal charts II.II.3 and II.II.4. Specific rule firings will be mentioned at aporopriate goal transition points to further specify system activity. The appendices A.G2 and A.S2 are not included in this report but are available from the author.

A.G2

The strategy of perception utilized by the subject in this protocol is that of recognizing successive objects, and thus the RAA implementation of AA-SYS is the one active here. As the first vertex is seen and entered into STM, REC-SYS is fired with goal RN0. The right angle suggests a square or rectangle, which AA-SYS then proceeds to attempt to confirm utilizing the constructed image as a source of EXP and ATT specifications prior the VI-SYS activations.

Referencing the protocol now, the subject in statement [S1] says triangle. This has been assimilated into account by ignoring it as a mispoken word "angle" and noting statement [S3], commencing at frame Vt0, which indicates a square goal has been active. As noted in Figure II.II.3, at V9 the goal in charge changes from K02 to 002, the square now being perceived as overlain, due to the encountering a TE vertex..

The program at the corresponding point would fire rule K022, which alters the object image to that of 02(c) and alters the goal to 002. AA-SYS retraces part of the object and encounters new information until another possible overlaying vertex has been located. Note that the new hypothesis of the overlain square does not require a REC-SYS activation, but is purely an accommodation of the image in STM to the conflicting input by AA-SYS itself. The goal of 002 remains the strategy until a point corresponding to V17 is reached, when the rule 0022 fires, noting that this newly seen

Figure II.II.3

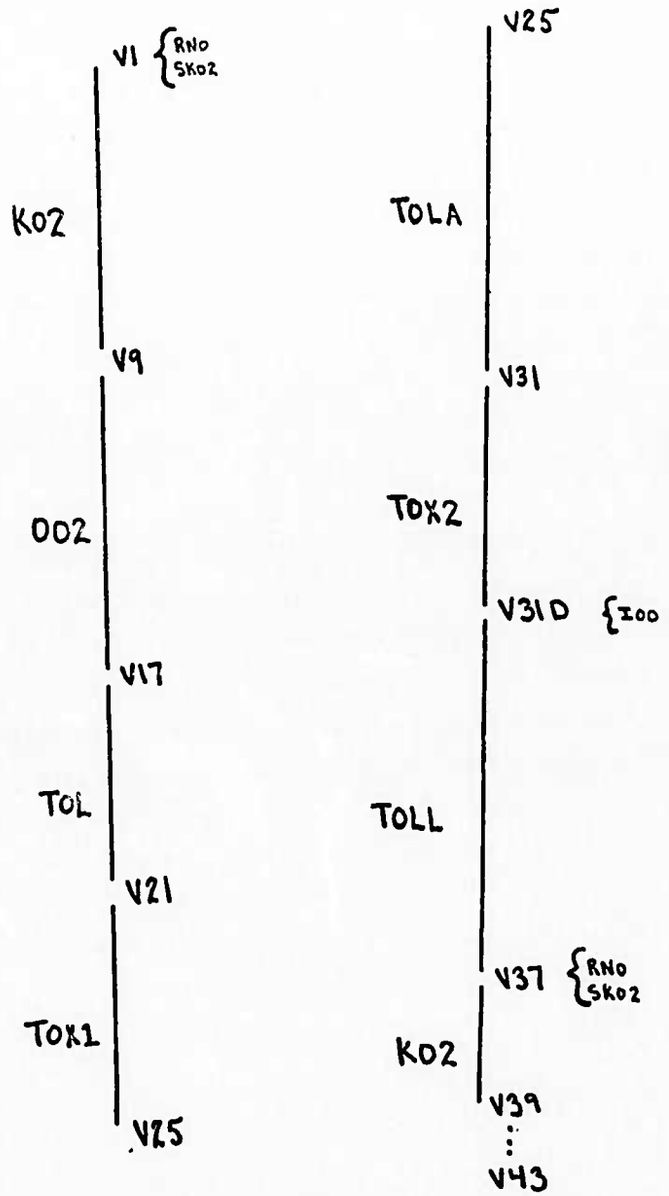
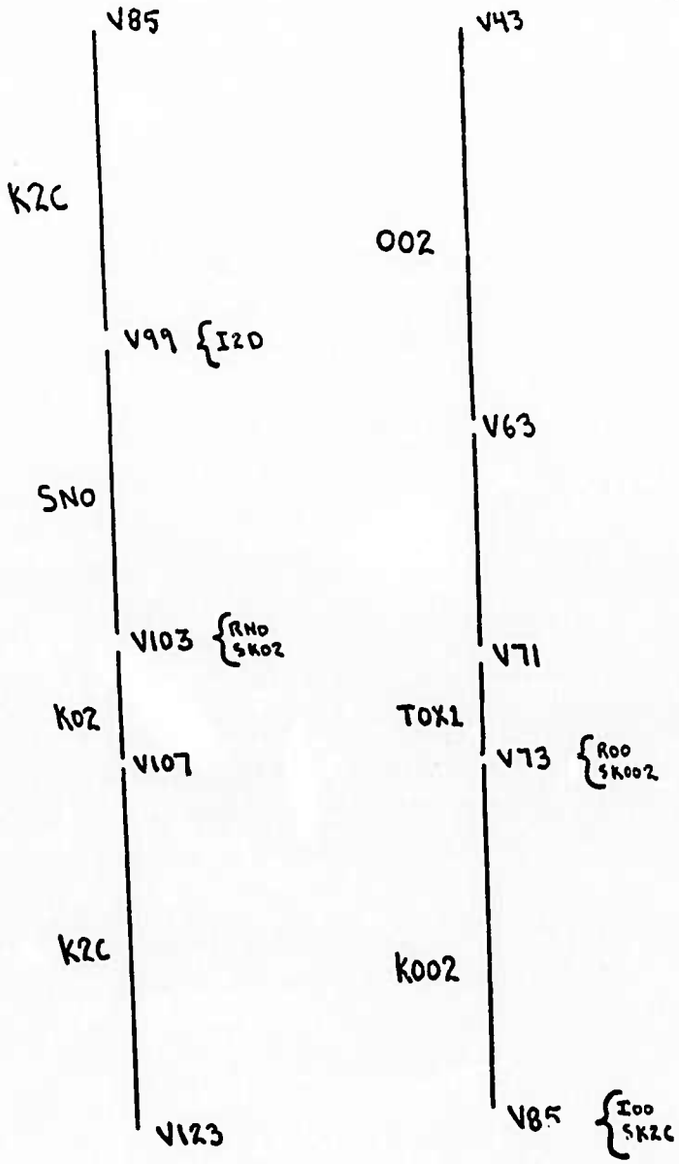


Figure II.II.3
(cont.)



vertex, entered into STM as V4, is possibly the other vertex where overlay occurs. The object image is altered then by the rule to become O2(d). The goal TOL becomes active, its strategy being to complete the overlaying line, setting expectations for VI-SYS in accordance with the contents of V3.

Correspondingly, the subject notes at V17 by statements [S5] that the overlain rectangle has been established and moves up the line to confirm the relationship to the vertex labelled 3 in frame V19. The subject then undertakes a series of moves, the inferred purpose of which is to confirm the ability of the neighboring region to indeed overlay the rectangle. Only the rectangle is mentioned throughout this episode sequence until protocol frame V37. The program likewise embarks on such a strategy. This strategy is realized by a sequence of goals TOX1, TOLA, TOX2, TOLL being active. Goal TOX1 moves out from the overlaying line, noting that sufficient distance is covered to overlay the rectangle and returns to the overlaying line. Goal TOLA retraverses the overlaying line, entering into STM the ending vertex previously not seen. Goal TOX2 moves out from the line, and as with TOX1 notes sufficient distance to cover the square and returns to the overlaying line. Upon return to the overlaying line the overalin square is incorporated into ITM. The overlaying line is not incorporated at this time since it will become part of the next object to be recognized, which recognition begins after TOLL retraverses the overlaying line one last time. Note that while under active goals TOX1 and TOX2 only the range of the move is noted, while the vertices seen are not entered in STM. That these vertices are not entered can be inferred from the statements [S11] and [S12] at frame V37, where the subject proposes a triangle as object goal.

Correspondingly, AA-SYS activates REC-SYS which constructs O8(a), changes line

Upon completing the confirmation of the overlaying object, INC-SYS is activated to incorporate the overlain triangle. Since nine new chunks have been introduced into STM since the side of the triangle overlaying the initial square has been referenced (L5), that side is not present in STM and is thus not entered into ITM. This forgetting is appropriate as it yields an indirect corespondence to the subject's later difficulty in the drawing task. With the present process definitions, STM must have less than 10 element chunks to realize this desired forgetting. In conjunction with the condition above (STM have atleast 9 chunks), VIPS must have nine chunks in STM.

Now we shall consider the subjects actions, attempting to show that the same strategic goals as are activated by the program are applicable to explaining that activity. This correspondence is illustrated in the goal episode chart (Figure II.II.3). The subject makes an extra rescan of the overlain triangle, thus further maintaining the 002 goal through V63. The subject then fully scans the overlaying line to establish its expected existence in views V63 to V71, the activity associated with goal TOL. Moving now across the bottom line with goal TOX1, the subject notes the simple vertex, and proposes the goal of rectangle for the new possible overlaying object, activating the activity associated with K002. This goal leads to the through scan of that object side, with the entering of a chunk for L15(a) at V79 as indicated. This through scan of that line is indirect inferential evidence of the goal K002 being active , as the associated image of the proposed object would serve as the source of EXP and ATT values. Upon completing the recognition of the overlaying object, the overlain triangle is entered into ITM. Statements [S22], [S23] and [S24] indicate reconsideration of that object at that time.

The program and protocol again duplicate movements from this point onward. Both

activate the strategy goal K2C, to rescan and reconfirm the recognition of the overlaying rectangle, this episode lasting until V99. The last small move up to the vertex on the rectangle side would not have been undertaken by the program. Then the active goal becomes I2D to incorporate this object into ITM. Statement [S27] indicates the subject's reconsideration of the object at the corresponding time.

Both subject and program move next to the position on the rectangle side, as yet only known in terms of a QUICKSEE element, under the active goal SNO, there to begin new object recognition. The program alters the line to L15(b) before activating REC-SYS with goal RNO. This activation constructs O16(a), which suggests a square or rectangle, constructed as O16(b). The move to the view of V105 causes a rerecognition as rule K024 is fired. The object image is altered and REC-SYS completes a triangle (O16(d)) as the next object goal. The subject did not speak throughout these movements, thus there is no direct evidence that this processing is occurring here. The actions have been inferred from other similar situations when the verbalizations there indicated the activity.

At V107 the object has been confirmed as a triangle and INC-SYS is activated to incorporate this object. A rule (not yet fully specified in its condition half for implementation) notes that it could be a further part of the previously seen overlain triangle, and returns to AA SYS setting up the goal K2C to attempt to confirm this goal while altering O8 to O8(e). This is proposed as another restructuring capability of INC-SYS. The object is reinstated in STM prior to accomodation. Both the subject and the protocol rescan the triangle, with the new idea finally being confirmed.

The final representation residing in ITM again contains the information sufficient to readily produce the verbal picture description of the subject. Beyond that, the missing

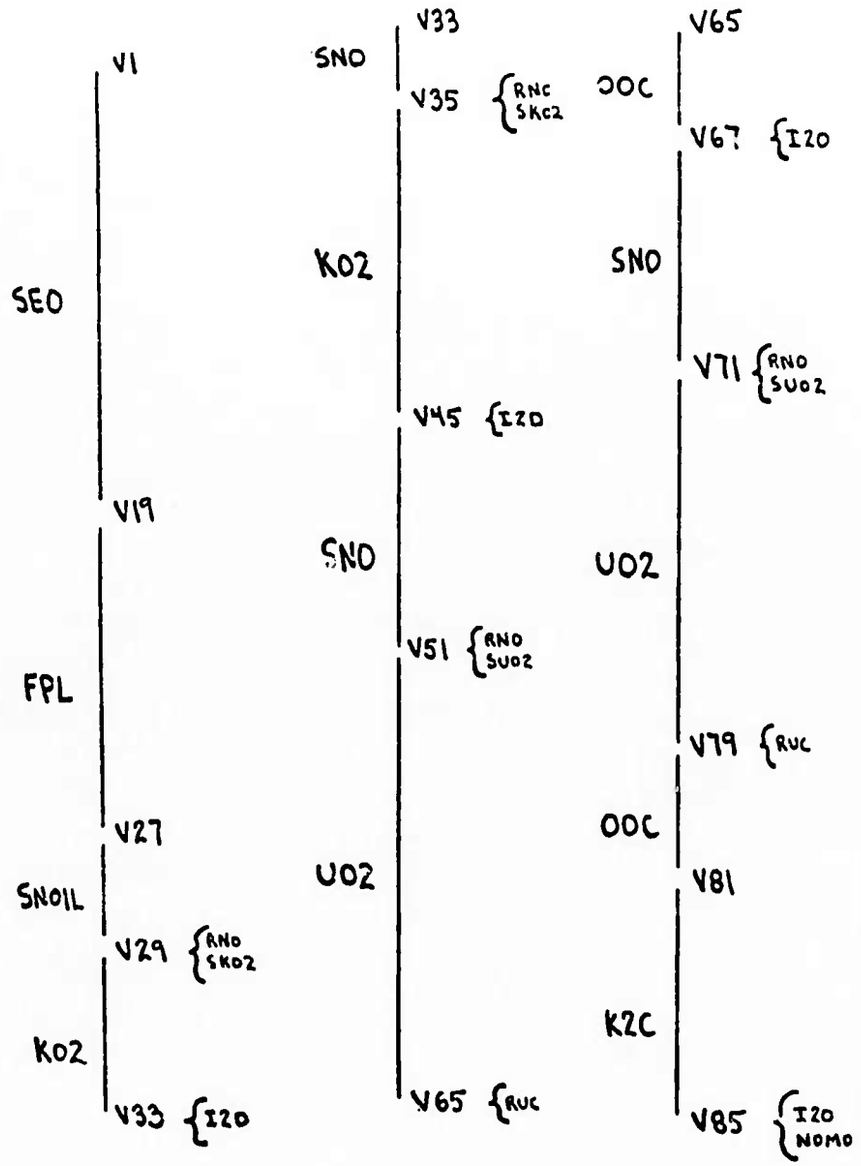
side of the triangle which contained the interraction with the rectangle on the left is a more than satisfactory explanation for the problems encountered by the subject in drawing from memory. Toward evaluation, the final image representation developed by VIPS is outstanding as a basis for the verbalization and drawing observed. Though the program and protocol part company for a while, the basic strategy sequences remain equivalent and the paths reconverge accordingly. The rules necessary to realize the final triangle consolidation have not been fully determined. There is adequate information in the image representation to allow this implementation .

A.S2

This protocol-program discussion concerns the actions of the strategy embodied by implemented AA-SYS version RAAS upon the same picture just discussed in section A.G2. As one references Figure II.II.4, it is noticed that the perceptual goal of SEO is active until V19. Throughout this series of moves (both the subject and program search identically), the program is merely entering new chunks into STM. The pictorial representations of these nine vertex chunks V1 through V9 are given in the appendix. During this sequence of moves the subject is merely naming what the vertex in view represents and moving onward around the outside boundary also. Statement [S7] notes the acute angle to be an angle of a triangle, but there is no indication that this becomes an active goal, being only a way to name or describe that acute angle.

At protocol frame V19, the subject indicates that he believes he has returned to a vertical he has seen earlier (frames V14 and V15). Statements [S20] and [S21] clearly imply this new inside line hypothesis has been made. The subject then undertakes a series of moves to verify this hypothesis, first finding the unknown line's end at V21

Figure II.II.4



and retraversing the complete line to V27. The program does likewise. As the vertex of frame V19 is supplied as visual information, rule SE06 fires, constructing partial line L10(a) and changing the active goal to FPL. As ViPS traverses the outside contour with goal SE0, it records and appropriately updates the last inside directed exit at any point as IXL of GOL. This facilitates the realization of such a visual hypothesis as this. The program moves up to find the right angle of view V21, entering vertex V11 and completing the proposed line to L10(b). To verify the line existence, AA-SYS utilizes the proposed line image and vertex chunk V7 to set EXP, ATT, and DIR. This results in a move down the whole line, with EXP returning YES indicating that the line is verified. This corresponds to the subject's acceptance of verification by statement [S24(a)].

The subject then moves up the line to investigate the object which he has now enclosed on the outside of the new vertical. He recognizes a triangle there, and moves to partially confirm this before proceeding, in view V35, to begin a new object recognition with that top right angle. The program also moves up to recognize that object on the line side. The activation of REC-SYS at V29 constructs O12(a), O12(b), and is able to complete the object image as O12(c), recognizing that as a triangle. Since the image is completely known, the active goal becomes K2C to confirm that completed image. The program scan differs from the subject protocol here . At the point corresponding to V33 the program would first move down to the TE vertex to complete the object image confirmation before moving to the right angle vertex seen at frame V35. There the program meets the subject activity again.

In correspondence to V35, the program activates REC-SYS with goal RNO. STM is again traversed, with successive partial object images O13(a), O13(b), and O13(c) being constructed. Also the line L10 is converted to an object side as illustrated as

L10(c). This incomplete object information is sufficient to suggest the square-or-rectangle object and this image is completed as O13(d) before returning control to AA-SYS with goal K02. The subject makes no note of such a goal at this point. Two factors in subsequent moves indicate reason for inferring such activity has been undertaken. One is the move straight through the side of the object in views V38 to V43. This seems to indicate that ATT has been set, and that the source of such a setting is a hypothesized object image. The second indication is the statement [S29] indicating the perception of a rectangle at the same point that the program also completes the marking of its object image and accepts the rectangle perception as complete. At this point the program incorporates this object and its environment into ITM and moves to begin a new object perception with active goal SN0.

The subject now moves up the new object side also to begin a new object perception as indicated by statement [S32]. Note here that line L14 has been entered into STM with QUICKSEE elements as a result of the through scan of the line in the previous confirmation of object O13. In moving to the new object start location both QUICKSEE vertices are visited resulting in first L14(b) and then L14(c) as alterations to the original chunk.

At this point the program activates REC-SYS with goal RN0 again. The STM image chunks are traversed, resulting in the partial object chunk O15(a) being constructed in STM. This is insufficient information for a proposed known object, and upon deactivation and return to AA-SYS the active goal becomes U02. The program, with this goal, searches the picture environment to complete the object image. Thus O15(b) is constructed, with V16 entered into STM at view V53. At V55 the straight angle on the inside results in the commencement of a new object side, with S17(a) becoming a

new chunk of short term memory. The program continues to the next new vertex, and the straight inside angle there results in a new side vertex being added to side S17 as shown in S17(b). Finally the acute angle is reached, as in view V63 and the side is completed and new angle added to O15 as shown in O15(c). The angle codes for these two new vertices added to the object are not internalized to the object image. This feature has been included to limit the number of corners which can be remembered for an object if it is unknown, as noted previously.

The subject activity varies somewhat from the program activity just described. The subject stops at the vertex of view V55, then instead of continuing down, he returns to the top angle and rescans the new side completely through to V63. There is no indication of a goal change here by the subject. His memory (image) would differ from the program's in that he would only have a QUICKSEE version of the second vertex on that new side while the program has developed the full representation.

Both the program and subject move next to the TE vertex shown at V65, and both make a decision here as to the new object perception, realizing that the outline has been completed. As with the earlier protocol A.P1, rule RUC1 is fired in REC-SYS which notes a possible overlay situation due to the interraction with a side of an already known object. The action of this rule alters O15(d) to become O15(e), the image now of an overlain triangle. The subject realizes the same conclusion, in the hesitant statement [S39]. The hesitation is to insure the overlaying line is as expected. The program suffers through this also with active goal OOC searching to determine if the expected vertex on the line is seen.

The subject then proceeds directly to the view of V71 to commence the recognition of a new, and last, object. The program would first make a new complete

review of the overlain triangle to confirm its existence (with goal K2C), before moving to the vertex of view V71 to commence this new perception. After that confirmation the triangle and its environment would be placed into ITM, with goal I20. Note that no attempt would be made to link this overlain triangle with the small one previously perceived and in ITM. Attempts are only made in the opposite direction, to link (integrate) newly perceived objects into previously perceived overlain objects of ITM. This is an example of the effect of input order upon visual perception.

With the program now at the point of V71, REC-SYS is activated. The incomplete object image 019(a) is insufficient to suggest a known object at this time and the goal U02 becomes again active for AA-SYS. The rest of the protocol and the rest of the program activity correspond completely. This activity also directly resembles (recreates) the previous sequence just discussed involving the overlain triangle. The outline is searched with vertices entered into STM and the object model accordingly updated until frame V79, when the outline has been completed. The same situation of interraction with a known object side is encountered, resulting in the overlain square or rectangle perception. The object is then rescanned, and entered into ITM. This activation of INC-SYS also notes that there are no unknown links in the new object's environment and the perception is complete. The reader is urged to read the protocol from frame V51, noting the similarity of activity involved between that undertaken in the perception of the triangle and that undertaken in the perception of the square. Keep in mind the episodal interpretation in terms of perceptual goals.

The final representation of ITM (as illustrated pictorially in the appendix) again bears a close relationship to the verbalization observed from the subject behavior and is sufficient to produce the drawing activity ,also.

2. Evaluation

Throughout the previous chapter sections the activity of the subject represented by the protocol has been compared to the activity of the inferred perceptual system, represented in several ways in the referenced appendices. At that time various correspondences were noted between these two behavior sequences. In this section, an attempt to provide an overall qualitative evaluation of the extent of correspondence between the observed subject behavior and that of the proposed perceptual system.

The word "attempt" is inserted above with regards to the realization here of a satisfactory, psychologically meaningful evaluation of the proposed perceptual processing system. This is due to the fact that no adequate theory of evaluation for proposed and implemented cognitive or perceptual models has been developed. As such, several "traditional" quantitative measures of relevant features of the program's performance are presented, to be utilized as a basis for the qualitative evaluation discussion.

RULE ACTIVITY

One measure often considered is the number of times a rule is fired within a system activation accounting for a subject protocol. This measure can shed some light on the general level of usefulness of the proposed rules, and on how ad hoc, or specialized, any rule or set of rules may be.

This measure for the proposed system is presented in Figures II.II.5 and II.II.6, one for each implemented strategy. The measure is presented in terms of how many times

Figure II.II.5

Goal Activity (Rule Activity)

RAA

Rule	A.P1	A.G2	A.S2	Total
SNO	4 (4)	2 (2)	4 (4)	10 (10)
RNO	4 (20)	3 (8)	4 (12)	11 (40)
ROO		1 (4)		1 (4)
RKI	1 (1)	1 (1)		2 (2)
RUC	2 (11)		2 (11)	4 (22)
KO2	3 (6)	4 (5)	1 (2)	8 (13)
UO2	2 (7)		2 (9)	4 (16)
K2C	2 (8)		3 (10)	5 (18)
SKO2	3 (3)	4 (4)	1 (1)	8 (8)
SUO2	2 (2)		2 (2)	4 (4)
SK2C	1 (1)	1 (1)	1 (1)	3 (3)
OOC	1 (1)		2 (2)	3 (3)
SOOC	1 (1)		2 (2)	3 (3)
OO2		2 (7)		2 (7)
I2D	3 (3)	2 (2)	2 (2)	7 (7)
I2O	1 (1)	2 (2)	2 (2)	5 (5)
TOX1		2 (3)		2 (3)
TOL		2 (4)		2 (4)
TOLA		1 (1)		1 (1)
TOX2		1 (2)		1 (2)
TOLL		1 (1)		1 (1)

Figure II.I.6

Goal Activity (Rule Activity)

RAAS

Rule	A,S1	A,S2	Total
SFO	1 (5)	1 (9)	2 (14)
FPL		1 (2)	1 (2)
SNOIL		1 (1)	1 (1)
TFL			
SFOA			
ICO	7 (7)		7 (7)
SIO	7 (7)		7 (7)
MVIL	1 (3)		1 (3)
LOV	1 (2)		1 (2)
SIL	2 (4)		2 (4)
IIO	1 (1)		1 (1)
RIO	1 (5)		1 (5)
LOO	1 (1)		1 (1)
MLTU	1 (1)		1 (1)
IIC	1 (1)		1 (1)
LIO	2 (3)		2 (3)

a perceptual goal becomes active during the system processing for a given picture and protocol, and how many rule firings occur with that goal active (in parentheses). The goals are ordered according to their degree of activity. Each goal partitions out a small tactically determined group of rules. This measure indicate how many times each small group of rules become relevant to the system activity, and for how many system cycles the decision (tactical) rationale of this group determines the rule fired. The measure is presented for each overall strategy, each strategy having its associated group of rules and rule transitions as noted earlier. Note that for A.S2, the strategy of RAAS defaults to that of RAA when object recognition opportunities present themselves. Thus, the rules of RAAS have been used less.

This measure does not directly relate to how well any subject behavior is explained by such rule firings. The measure primarily gives some quantitative evaluation of a proposed goal and its associated rule logic in terms of its usefulness with the system operation. One element of justification for the proposal and existence of a rule or a group of rules is their demonstrated use. As can be seen from the quantitative tables, the primary goals of the implementations (K02,U02,O02, SEO,I2D,ICO,RNO,RUC,RK1) are sufficiently exercised by several processing situations.

HOLE MOVEMENT CORRESPONDENCE

The second quantitative measure to be considered is the percentage of observed hole movements for which the inferred system can be said to account. Each protocol is first considered separately in terms of episodes of subject moves and program moves. An episode is determined by an active perceptual goal which is inferred for a subsequence of activity.

Figure II.II.7(a) shows the move comparison for protocol A.P1. The first labelled column shows the number of subject hole movements associated with each episode subsequence. The second column shows the number of prograr picture position changes for the corresponding episode. The last column indicates the ar ive goal for that subsequence. Note that when SNO is the goal, the program sets the current picture pointer (CPP) to the new object location immediately, and does not traverse a path as the subject must. This is the only case (with SNO active) in which VIPS does not attempt to account directly for the subject hole movements.

To the left of these three labelled columns a star (*) may or may not be found. This marking denotes those subsequences during which the program and subject undertake the same sequence of "hole" movements. There must also be some indication that the active goal of the program at that time (column 3) can also be inferred to be that of the subject before a subsequence may be starred. Such indication may be supplied by direct subject verbalization contained within the transcribed protocol, or by a repeated regularity of activity associated with such a direct verbalization in other observed circumstances.

Finally the moves are totalled for both the program and subject. II.7(b), II.7(c) and II.7(d) present the same information for the protocols A.S1, A.G2, A.S2 respectively. Those cases where unstarred subsequences are indicated will be discussed later. Presently, the discussion will be concerned with what percentage of the total considered hole movement activity has been starred and is thus representative of activity for which the proposed model can be said to account.

Figure II.II.8 presents in tabular form such a composite move comparison. Column A indicates the total subject moves undertaken in the behavior recorded for each

Figure II.II.7(a)

Move Comparison

A.PI

	SUBJECT	PROGRAM	ACTIVE GOAL
*	3	3	KO2
	1	~	(SNO)
*	5	5	UO2
*	1	1	OOC
*	4	4	K2C
	2	~	(SNO)
*	3	3	KO2
	1	~	(SNO)
*	2	2	UO2
*	4	4	K2C
TOTAL MOVES	26	22	

Figure II.II.7(b)

Move Comparison A.S1

	SUBJECT	PROGRAM	ACTIVE GOAL
*	9	9	SGO
*	6	6	SIO
*	3	3	MVIL
*	2	2	LOV
*	3	3	SIL
*	1	1	LOC
*	2	2	LIC
\	6	1	MLIL
*	1	1	LIO
	1		
TOTAL MOVES	34	28	

Figure II.II.7(b)

Move Comparison

A.G2

	SUBJECT	PROGRAM	ACTIVE GOAL
*	2	2	KO2
	2		
*	4	4	OO2
*	2	2	TOL
*	2	2	TOX1
*	1	1	TOLA
*	2	2	TOX2
*	1	1	TOLL
*	1	1	KO2
	2		
*	3	3	OO2
	3		
	2	1	TOL
*	1	1	TOX1
*	2	2	KOO2
	2		
*	3	3	K2C
		1	K2C
	4	~	(SNO)
*	2	2	KO2
*	3	3	K2C
TOTAL MOVES	44	31	

Figure II.II.7(c)

Figure II.II.7(d)

Move Comparison A.52

	Source	Program	Active Coat
*	9	9	SEO
*	2	2	FPL
*	1	1	SNOIL
*	2	2	K2C
		1	K2C
	1	~	(SNO)
*	2	2	KO2
	1		
	3	~	(SNO)
*	2	2	UO2
	2	2	UO2
*	1	1	UO2
*	1	1	OOC
		3	K2C
	2	~	(SNO)
*	4	4	UO2
*	1	1	OOC
*	2	2	K2C
		2	K2C
TOTAL MOVES	36	35	

Composite Move Comparison

Composite Move Comparison

	1 A SUBJECT MOVES	2 B PROGRAM MOVES	3 C MOVES TO EXPLAIN	4 D EXPLAINED MOVES	5 % C of A	6 % D of C	7 % D of A	8 % D of B
A.P1	26	22	22	22	84.6	100	84.6	100
A.S1	34	28	34	27	100	79.4	79.4	96.4
A.G2	44	31	40	29	90.9	72.5	65.9	93.5
A.S2	36	35	30	27	83.3	90.0	75	88.1

Figure III.8

protocol noted at the left. Column B indicates the number of repositionings of the current picture pointer undertaken by the implemented system in accounting for that same protocol. Column C indicates the number of moves for which the implemented system intends to account, this number being column A minus the number of subject moves undertaken while the inferred active goal was SNO. Column D is the total of the moves found in the starred subsequences for that program - protocol comparison.

The fifth column (% C of A) indicates what percentage of the total subject moves it is that the program intends to explain, the intended coverage of the subject's behavior. The next column (% D of C) indicates what percentage of the moves to be explained are in actuality explained. The seventh column (% D of A) indicates what percentage of the total subject moves (including those with SNO active) are accounted for by corresponding, equivalent program action. The last column (% D of B) indicates what percentage of the moves undertaken by the program corresponded to observed subject activity and were thus of value in explaining the subject's behavior.

The "% D of A" column indicates that VIPS consistently attempts to account for more than eighty percent of the total observed subject hole movements. All of those movements not considered are associated with the goal SNO. It is felt that these moves are not critical to achieving an explanation of the perceptual activity, which is the primary concern. As seen, most of the moves observed are still to be explained. Also, it can be noted that over eighty-eight percent of the moves undertaken by the program have a claimed direct correspondence to an observed subject hole movement (% D of B). Thus, the activity undertaken by the implemented system, in terms of hole-movements, has a high density of explanatory relevance.

To be better able to assign meaning to the percentages displayed in columns six

and seven, those columns which indicate the percentage of subject moves explained, some comparative values are given. Figure II.II.9 shows the percentage of right move choices which would be made by a uniformly random, line-following, hole movement generator. In Column I the value is calculated given the generator is positioned at the correct picture location at each moment of choice and must select one of two or three possible vertex exit directions. As such the value is a weighted average of one-half and one-third, determined by the vertices visited by the subject. There is no consideration of movement sequences here and, as such, is a most generous measure.

Column II considers the protocol in terms of the goal related episodal subsequences. The number of moves of each such subsequence is shown in Figure II.II.7(a)-(c) for each respective protocol. The probability of the random move generator producing each such subsequence of moves is first calculated. This now involves joint probability calculations and thus the multiplication of the correct choice probabilities for each vertex visited in an episode. The average of these episodal values is presented for each protocol in Column II. A comparison of Columns I and II to the columns "%D of A" (#7) and "%D of C" (#6) indicates the higher correspondence which is realized by VIPS.

A second set of basic comparative percentage values have been generated for another simple movement decision model and are presented in Figure II.II.10. The movement generator at each point is again uniformly distributed over possible vertex exit directions. The new strategy is that the generator never considers the move in the direction opposite to that from which the present vertex has been entered. In other words, the model does not consider taking a directly backtracking move. Thus, for a simple two-exited vertex, the move generator only has one direction to consider

Figure II.II.9

Random moves

From Table XI.8

	A	B	Column #6	Column #7
A.P1	38.3	10.5	100	84.6
A.S1	43.2	12.0	79.4	79.4
A.G2	42.9	13.6	72.5	65.9
A.S2	42.5	25.6	90.0	75.0

in % of moves accounted for.

Figure II.II.10

Random moves, no backtracking

From Table XI.8

	A	B	Column #6	Column #7
A.P1	60.3	26.9	100	84.6
A.S1	65.9	27.2	79.4	79.4
A.G2	63.5	21.9	72.5	65.9
A.S2	64.3	25.5	90.0	75.0

in % of moves accounted for.

Figure II.II.9

and is either right (value 1) or wrong (value 0). Similarly with the three exited vertices, this move choice model is either wrong (value 0) when the subject does backtrack, or has a one-half probability of being correct otherwise.

As with the move model considered previously, Column A of the table of Figure II.II.10 presents the percentage of correct move choices made considering the protocol move by move with the move generator correctly positioned at each choice vertex visited by the subject. Column B is again the percentage figure with the protocol considered as a sequence of episodes. The value presented is the result of averaging the episodal subsequence probabilities, these calculations involving the multiplications of each vertex choice probability within a subsequence to yield the appropriate joint probability for the episode. The corresponding columns reflecting VIPS move correspondence again indicate a consistently higher value.

Figure II.II.10

The values in the last two tables (II.9 and VI.10) indicate that at the surface consideration of hole movement choice, the proposed system consistently out performs even the most generous evaluations of the two simple-strategy (probabilistic) move generators discussed.

GOAL CORRESPONDENCE

The proposed imagery and perceptual system is doing much more than merely traversing the presented line drawing, though. The system is generating new goals (according to stimulus characteristics and the goal transition network) and integrating each new successive vertex input into the image representation in light of the currently active goal. An overall image representation (perception) is being developed also. An attempt to evaluate how well the behavior of the proposed perceptual

system corresponds to the observed subject behavior in terms of goal transitions leads to further consideration of the protocols at the episodal level.

As discussed previously, the episodes within a given protocol are determined by the active goals which have been inferred. Such an approach leads to II.1-VI.4, which were presented and utilized in conjunction with the program-protocol discussions. To generate a quantitative basis for a qualitative evaluation of goal correspondence, two measures are considered. Column A of Figure II.II.11 is the percentage of active goals of the program which appear to have a direct inferrential correspondence to subject activity. This correspondence need not be in terms of a directly verbalized goal. If a new object proposition is mentioned, this is indicative of some recognition activity having transpired and a recognition goal having been active. Quick movements with utterances of "right" or "there that is" is indicative of a retraversal for confirmation.

The values of Column B of Figure II.II.11 indicate the percentage of goal transitions realized by the implemented system in direct correspondence to the equivalent point of transition inferred for the observed behavior. Note that this value is consistently lower than the associated Column A value. This reflects the previously mentioned characteristic of the program activity, which is to part ways with the subject behavior, only to again coincide throughout a subsequent goal-determined episodal segment. Such a lack of strict correspondence to the points of goal transition is the result of an attempt to realize a more general explanation of the visual process, avoiding the addition of further ad hoc rules of questionable explanatory and psychological value. Thus, while fitting (explaining) some episodal sub-sequences exactly, occaisionally the program undertakes several more (or less) hole movements under a currently active inferred goal than does the subject. II.7 (a) - (d) serve as the bases for the values of Figure II.II.11.

Figura II.II.11

Goal and Goal Transition Correspondance

	A	B
A.P1	10/10 ~ 100%	7/9 ~ 78%
A.S1	8/9 ~ 89%	7/9 ~ 78%
A.G2	15/16 ~ 94%	10/15 ~ 67%
A.S2	13/14 ~ 93%	7/11 ~ 64%

FINAL IMAGE EVALUATION

Now to consider a qualitative evaluation for the degree of correspondence existing between the final ITM image representation developed by the program and the subject's final perception as can be inferred from the verbal and drawn description. The verbal description is considered (assumed) to be a verbalized sampling of the available memory contents. This sample is realized through a traversal of the image structure, verbally noting encountered concepts and features to an extent deemed sufficient for the required specification. That more is known than is given verbally is clearly indicated by the usually successful drawing depiction. This drawing depiction is likewise proposed as being the consequence of an image traversal. In one case appropriate linguistic processes are applied, while in the other case motor processes are invoked.

No attempt has been made to develop an implementation of these output processes beyond the simple verbalization function utilized to produce the program verbalization of A.P1. That verbalization function represents the one generalization which can be made concerning the obtained descriptions. That is that the objects are reported in the order in which they were recognized (and incorporated). This observation led to the proposal of the FIRST-OB reference pointer of ITM and the NEXT-OB property of each chunk header of an OBJECT type chunk of ITM. The implemented verbalization function enters the image at the chunk header referenced by FIRST-OB and traverses the image according to the available NEXT-OB links, reporting the object names of the traversed chunk header elements. The determination of what further information the subject verbalizes to specify the line

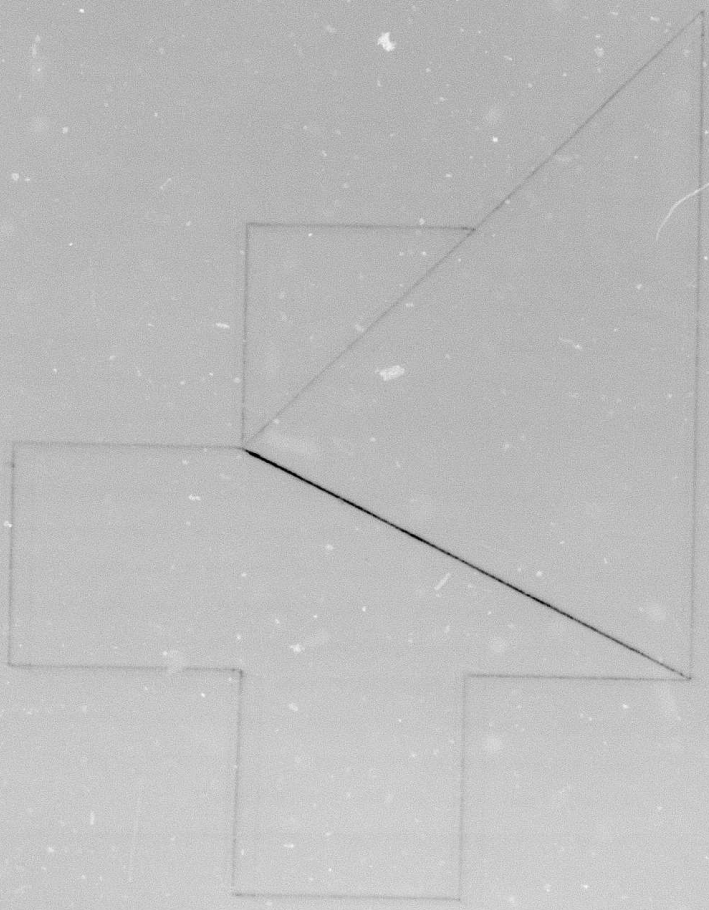
drawing would have again required ad hoc rule firing conditions. Sufficient conceptual information consistently exists in ITM for the realization of the obtained description.

The analysis (and implementation) situation with regard to the obtained drawing sequences is similar to that for the verbal descriptions. No sufficiently well specified generalization of the observed drawing stategies can be inferred to serve as a basis for a drawing implementation capable of consistent correspondence to the observed sequences. Some generalizations at a verbal level are possible. The subjects tend to draw object by object, though sometimes continuing a straight edge when possible. If the perceptual strategy involved the realization of an outline determination (RAAS), this outline may first be drawn. Note that the words "sometimes" and "may" are used to indicate a preference for behavior, but not a definite rule specification. In all cases the image of ITM embodies sufficient information and traversal possibilities to allow any observed drawing sequence. Note that the forgetting of A.G2 is also embodied in that final ITM representation.

On the basis of this evaluation, it is argued that VIPS more than adequately yields some insight into the nature of the human perceptual behavior which has been observed.

Appendix Group I 1

A. Concept

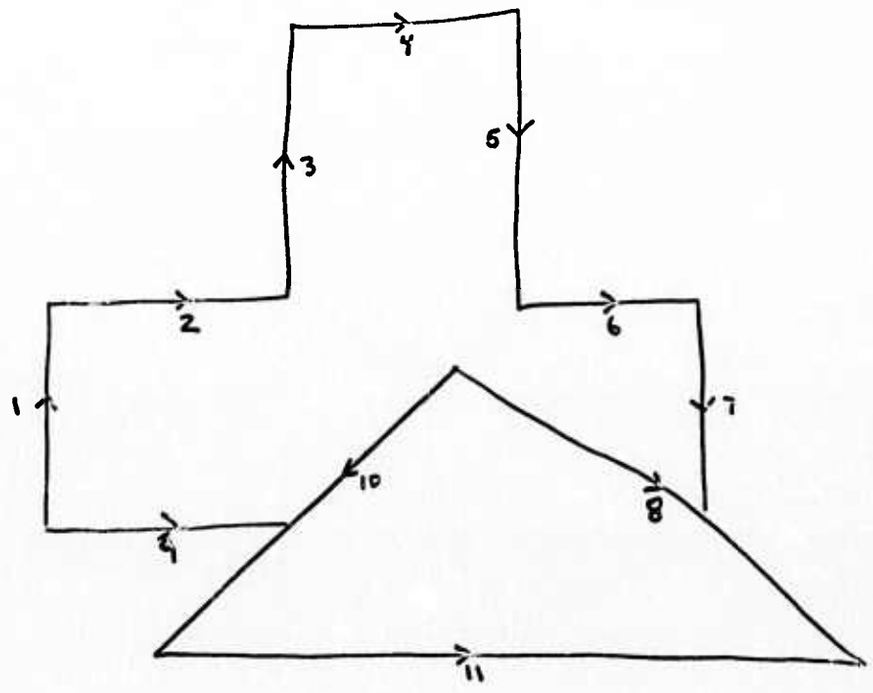


I.2.B
VTIME=4 sec.

a cross uh
with a uh (while looking)
triangle superimposed on it

a cross with a triangle superimposed on it
(while drawing)
oh let's see
where the triangle was
don't tell me I've blown this
I okay
(after drawing)
I blew it
I know I blew it

I.2.B

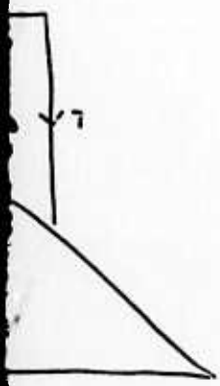


Notes: Hesitates after 6 - moves pen to bottom of line 1, then below corner (5,6) where lower cross corner would be.

Hesitates also after 7.

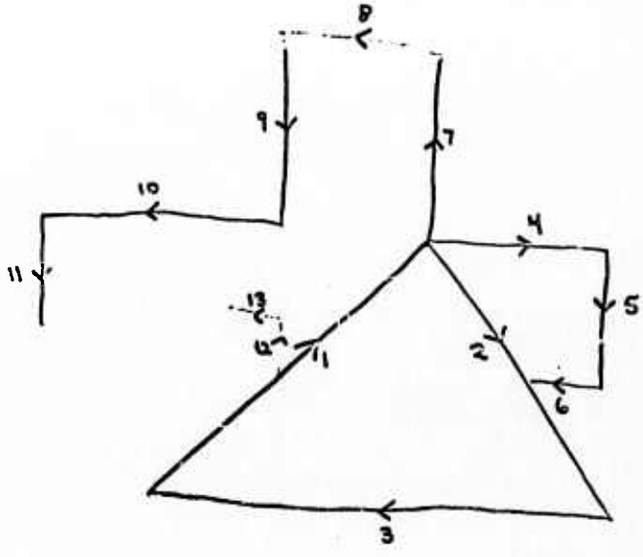
I.2.P
VTIME=9 sec.

in the foreground was uh...
a lopsided triangle
two-dimensional
and behind that
not um
on a two-dimensional scale again
there was a
um
a cross-type object
um
(pause 2 sec.)
yeah a cross



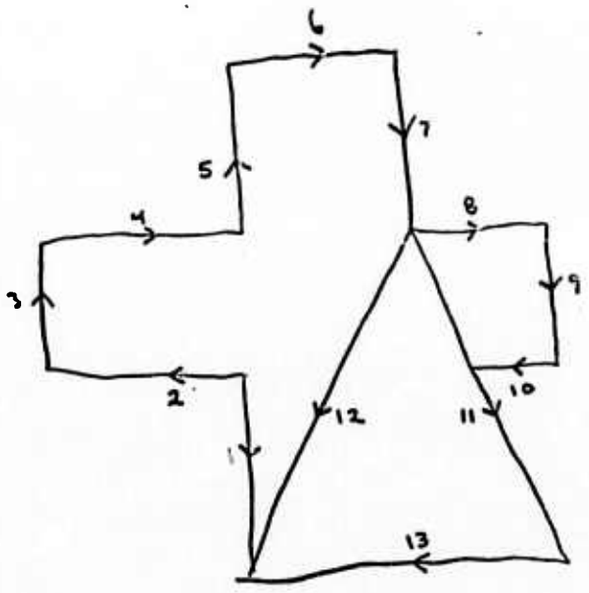
f line 1,
eve lower

(a)



Notes : Long hesitation after 1, then finishes triangle
Hesitates 3/4 of way through 10, then finishes
After 11 twice puts pen on corner (1,3), then draws 12 and 13.
Tries to erase 12, 13, 8 - then starts over

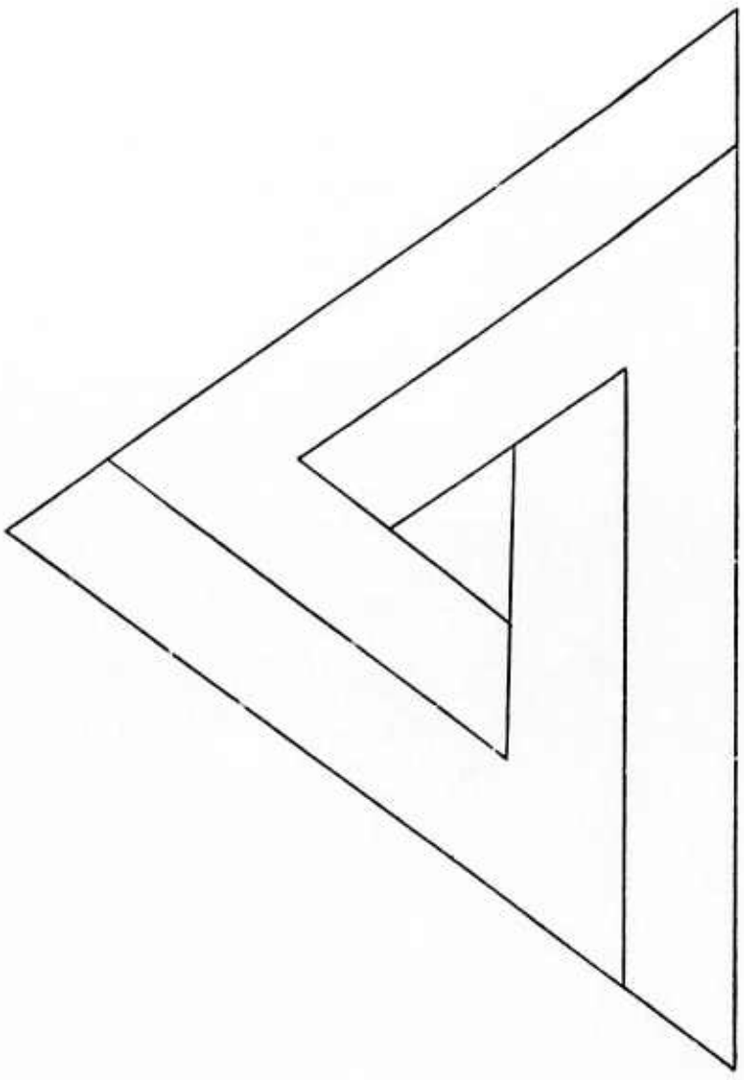
I.2.P(6)



Group I.2

I.7.B
VTIME=2

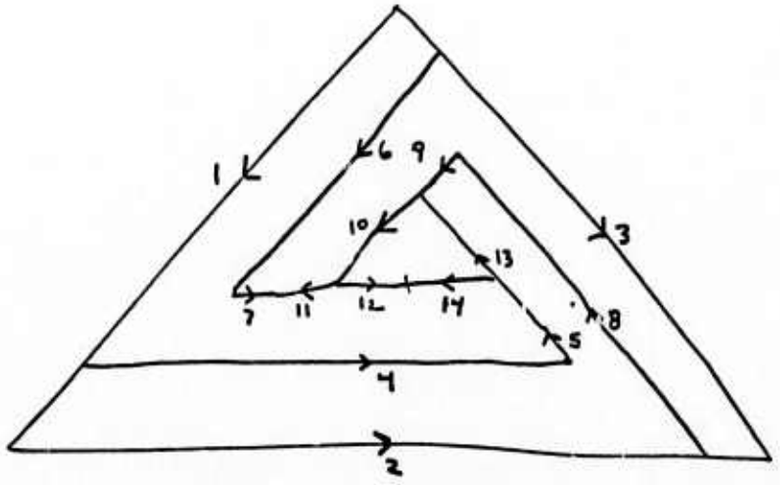
(while



I.7.B
VTIME=22 sec.

uh
it's uh
triangle
which is composed of
a center triangle
and
3 L shaped bars
(while drawing)
I know I got to go that way
and
come down here
and
I got to go that way
and I'm going come up here
go that way
and now I've got to bring these together
uh...
yeah, that's right

L.T.B.



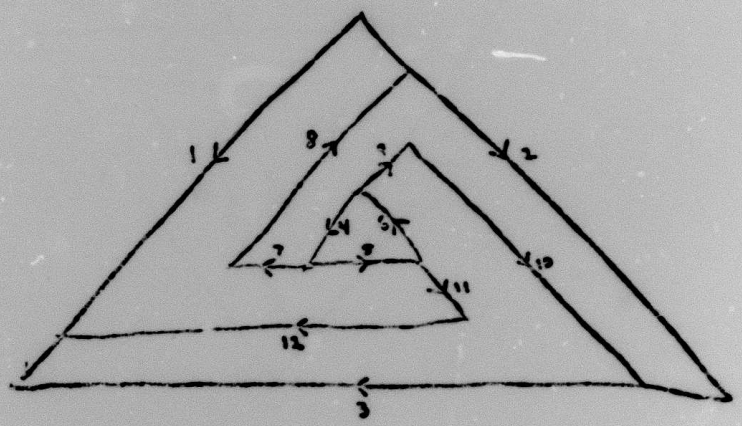
Note:

would hesitate before adding the short portions indicating direction.

I.7.P
VTIME=28 sec.

It's um
one big triangle
little triangle in the center
and um
um
lines between the little triangle and the big triangle (laughter)

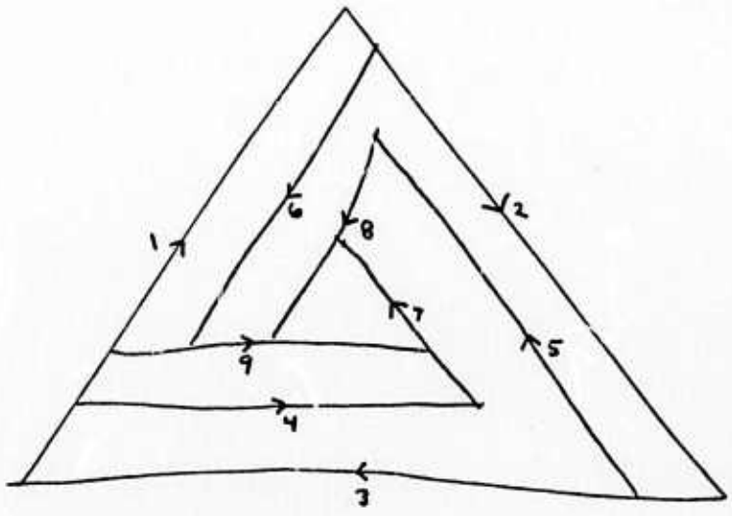
1.7.S
VTIME=7 s



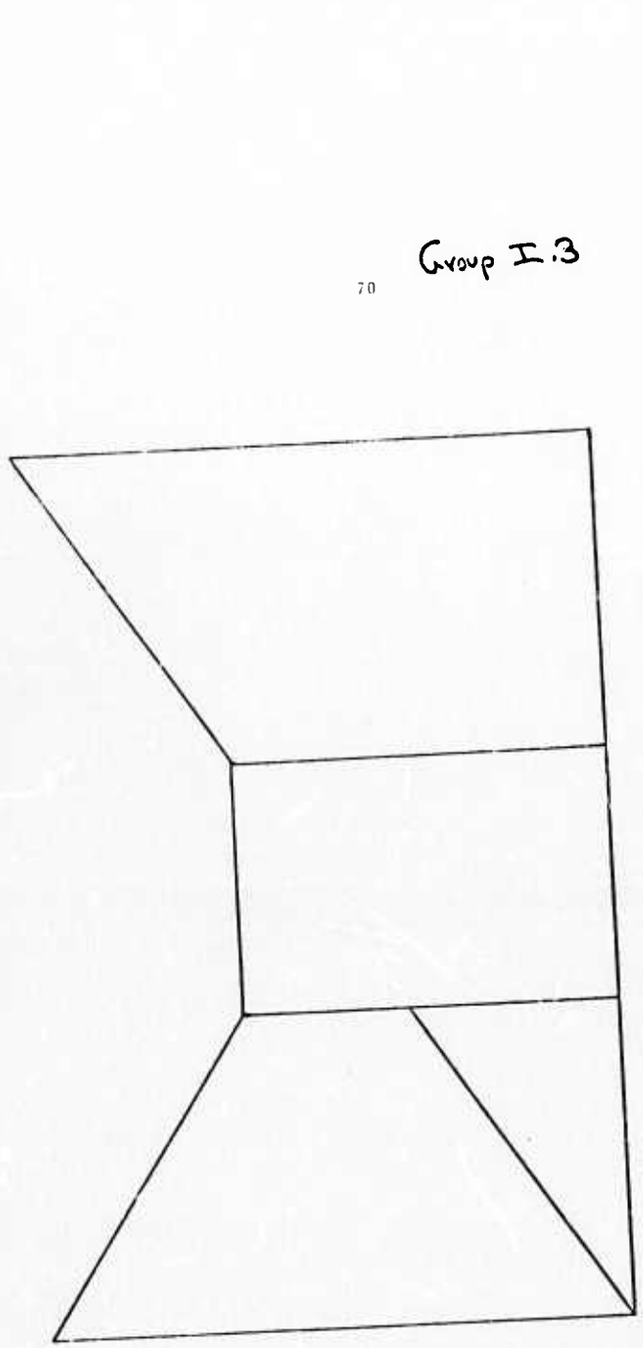
I.7.S
VTIME=7 sec.

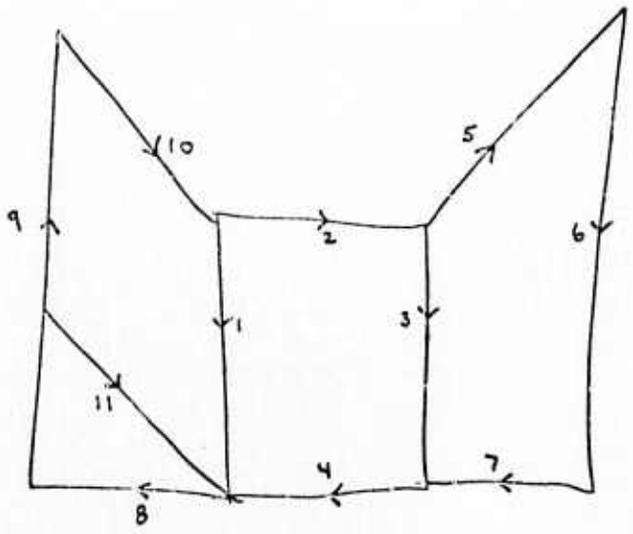
it's uh
it's a basic triangle shape
and
(pause 2 sec.)
starting in the lower left hand corner there's a
parallel seg
there's a parallel segment that's goes
all the way across parallel to the bottom over to the right hand edge except
equal to a the same width
that is wide on the right hand edge
and then it goes up until it would meet
the equivalent thing
on the
on the upper left hand edgie and in the center is the little triangle

1. 5 (a)



Group I.3




10
5
9
2
6
1
3
11
4
7
8

APPENDIX A.LTM

SIDED
NUMS NUMber of Sides
DIM DIMension
OVERLAY
SIE
COM COMplete
VER VERtex
THREE
FOUR
FIVE
SIX
PNAME
VALUE
YES
NO
CON CONtained
MARK
SPEC SPECification
VSPEC Vertex SPECification
NAME
OPPO OPPOsite
TYPE
PNUM Position NUMber
CR Current Reference
FI First
PR Prime Reference
CA Completing Angle
IXL Inside eXit List
NEXT-OB
LAST

VERTEX SPECIFICATIONS

V2 Vertex 2-exits
TE
MU MUltiple
RT Right angle with a Tail
KR K with Right angle

ANGLE CODES

ACA
RTA
OBA
STA
SAA

(THE ME OF SH IS LO)
(THE SH OF SH IS ME)
(THE LO OF ME IS LM)
(THE ME OF ME IS LS)
(THE SH OF ME IS LO)
(THE LO OF LO IS LL)
(THE ME OF LO IS LM)
(THE SH OF LO IS LS)
(THE LO OF LS IS LL)
(THE ME OF LS IS LL)
(THE SH OF LS IS LL)

IMAGE BODY ELEMENT TYPES AND ASSOCIATED PROPERTIES

END

SID	SIDe end
ULE	Unknown Line End
LEX	Line End eXternal
LEI	Line End Internal
LS1	Line Side 1
LS2	Line Side 2
LXL	Line eXternal Link
LXX	Line eXternal eXit
SEL	Side End Link

XIT

KEX	Known EXit
KLX	Known Line-linked eXit
KOX	Known Overlay-linked eXit
KLL	Known within-Line Line-linked exit
UEX	Unknown EXit
ABX	ABsent eXit
XLL	eXit within-Line Link
XLX	eXit Line link eXternal
OXL	Overlay eXit Link
DIV1	Direction Internal Vertex 1
DIV2	Direction Internal Vertex 2
STX	Straight Through eXit
DVX	Direction Vertex eXit
RVX	Range Vertex eXit
LVX	Link Vertex eXit

QUICKSEE

UQX Unknown Quicksee eXit
NUMX NUMber of eXits
ONE
TWO
TD1 Traversal Direction 1
TD2 Traversal Direction 2

INTERNAL

INT INTernal
ILE Internal Line End
IOC Internal at Overlay Cutoff
ICS Internal at Cutoff with Side link
INS INternal with Side link
INF INternal with Face link
INO INternal with Object link
DIX Direction Internal eXit
RIX Range Internal eXit
LIX Link Internal eXit
LEL Line End Link
OCL Overlay Cutoff Link
ICL
ISL Internal Side-end Link
ESL Equivalent Side Link
EOL Equivalent Object Link
EFL Equivalent Face Link
STIC STraight Internal Continue

ANGLE

KRA Known Related Angle
KIA Known Internal Angle
PIA Proposed Internal Angle
KOA Known Overlay Angle
KEA Known Equivalent Angle
ANG ANGle (code)
EAL Equivalent Angle Link
SIE

CHUNK TYPES

VERTEX
OBJECT
SIDE
FACE
ILINE
LINE

LINE SPECIFICATIONS

DIAGONAL
VERTICAL
HORIZONTAL

RLTM NODES

XX
AX
VER1
VER2
VER3
VER4
VER5
VER6
VER7
VER8
VER9
VER10
VER12
VER13
VER11
VER14
VER15
VER16

COMP COMPlement
PDIR Prime DIRection
LINK
BDIR Back DIRection
FDIR Face DIRection

ANGLE INTERRELATIONSHIPS

(THE COMP OF ACA IS SOA)
(THE COMP OF RTA IS SRA)
(THE COMP OF OBA IS SAA)
(THE COMP OF STA IS STA)
(THE COMP OF SAA IS OBA)
(THE COMP OF SRA IS RTA)
(THE COMP OF SOA IS ACA)

(THE ACA OF ACA IS RTA)
(THE RTA OF ACA IS OBA)

(THE OBA OF ACA IS STA)
(THE STA OF ACA IS SAA)
(THE SAA OF ACA IS SRA)
(THE SRA OF ACA IS SOA)

(THE ACA OF RTA IS OBA)
(THE RTA OF RTA IS STA)
(THE OBA OF RTA IS SAA)
(THE STA OF RTA IS SRA)
(THE SAA OF RTA IS SOA)

(THE ACA OF OBA IS STA)
(THE RTA OF OBA IS SAA)
(THE OBA OF OBA IS SRA)
(THE STA OF OBA IS SOA)

(THE ACA OF STA IS SAA)
(THE RTA OF STA IS SRA)
(THE OBA OF STA IS SOA)

(THE ACA OF SAA IS SRA)
(THE RTA OF SAA IS SOA)

(THE ACA OF SRA IS SOA)

OBJECT IMAGE CONSTRUCTION KNOWLEDGE

(THE ACA OF LE IS ☒((UL DL) (DL UL)))
(THE RTA OF LE IS ☒((UP LE) (DO LE)))
(THE OBA OF LE IS ☒((UR UL) (DR DL)))
(THE SAA OF LE IS ☒((DR UR) (UR DR)))
(THE SRA OF LE IS ☒((DO RT) (UP RT)))
(THE SOA OF LE IS ☒((DL DR) (UL UR)))

(THE ACA OF UL IS ☒((UP LE) (LE UP)))
(THE RTA OF UL IS ☒((UR UL) (DL UL)))
(THE OBA OF UL IS ☒((RT UP) (DO LE)))
(THE SAA OF UL IS ☒((DO RT) (RT DO)))
(THE SRA OF UL IS ☒((DL DR) (UR DR)))
(THE SOA OF UL IS ☒((LE DO) (UP RT)))

(THE ACA OF UP IS ☒((UR UL) (UL UR)))
(THE RTA OF UP IS ☒((RT UP) (LE UP)))
(THE OBA OF UP IS ☒((DR UR) (DL UL)))
(THE SAA OF UP IS ☒((DL DR) (DR DL)))
(THE SRA OF UP IS ☒((LE DO) (RT DO)))
(THE SOA OF UP IS ☒((UL DL) (UR DR)))

```
(THE ACA OF UR IS ℝ((RT UP) (UP RT)))
(THE RTA OF UR IS ℝ((DR UR) (UL UR)))
(THE OBA OF UR IS ℝ((DO RT) (LE UP)))
(THE SAA OF UR IS ℝ((LE DO) (DO LE)))
(THE SRA OF UR IS ℝ((UL DL) (DR DL)))
(THE SOA OF UR IS ℝ((UP LE) (RT DO)))

(THE ACA OF RT IS ℝ((DR UR) (UR DR)))
(THE RTA OF RT IS ℝ((DO RT) (UP RT)))
(THE OBA OF RT IS ℝ((DL DR) (UL UR)))
(THE SAA OF RT IS ℝ((UL DL) (DL UL)))
(THE SRA OF RT IS ℝ((UP LE) (DO LE)))
(THE SOA OF RT IS ℝ((UR UL) (DR DL)))

(THE ACA OF DR IS ℝ((DO RT) (RT DO)))
(THE RTA OF DR IS ℝ((DL DR) (UR DR)))
(THE OBA OF DR IS ℝ((LE DO) (UP RT)))
(THE SAA OF DR IS ℝ((UP LE) (LE UP)))
(THE SRA OF DR IS ℝ((UR UL) (DL UL)))
(THE SOA OF DR IS ℝ((RT UP) (DO LE)))

(THE ACA OF DO IS ℝ((DL DR) (DR DL)))
(THE RTA OF DO IS ℝ((LE DO) (RT DO)))
(THE OBA OF DO IS ℝ((UL DL) (UR DR)))
(THE SAA OF DO IS ℝ((UR UL) (UL UR)))
(THE SRA OF DO IS ℝ((RT UP) (LE UP)))
(THE SOA OF DO IS ℝ((DR UR) (DL UL)))

(THE ACA OF DL IS ℝ((LE DO) (DO LE)))
(THE RTA OF DL IS ℝ((UL DL) (DR DL)))
(THE OBA OF DL IS ℝ((UP LE) (LE DO)))
(THE SAA OF DL IS ℝ((LE UP) (UP RT)))
(THE SRA OF DL IS ℝ((DR UR) (UL UR)))
(THE SOA OF DL IS ℝ((DO RT) (LE UP)))
```

CID Clockwise Internal Direction

```
(THE CID OF UP IS RT)
(THE CID OF UR IS DR)
(THE CID OF RT IS DO)
(THE CID OF DR IS DL)
(THE CID OF DO IS LE)
(THE CID OF DL IS UL)
(THE CID OF LE IS UP)
(THE CID OF UL IS UR)
```

GOALS (RAA)

OGOL
GOL

K02 Known Object 2-dimensions
K002 Known Overlaying Object 2-dimensions
002 Overlain Object 2-dimensions
00C Overlain Object Confirm
U02 Unknown Object 2-dimensions
U002 Unknown Overlaying Object 2-dimensions
K2C Known 2-dimensional Confirm
NOMO NO More Objects

RNO Recognize New Object
ROC Recognize Overlay Object
ROI Recognoze Overlain Interrupted
RKI Recognize Known Interrupted
ROKI Recognize Overlaying Known Interrupted
RUC Recognize Unknown Complete

I2O Incorporate 2-dimensional Overlain
I2U Incorporiate 2-Dimensional object
IOO Incorporate Overlain Object
IOK Incorporate Overlain Object Knowing overlaying
IOU Incorporate Overlain Object Unknown overlaying

SNO Start New Object
TOL Traverse Overlaying Line
TOX1 Traverse to Overlaying eXit 1
TOLA Traverse Overlaying Line Again
TOLL Traverse Overlaying Line Last
TOX2 Traverse Overlaying eXit 2
SK2C
SK02
SK002
SU02
SU002
S00C

OBJECT IMAGE GENERATING FUNCTIONS FOR THE NAMED OBJECTS

TR1
(THE NAME OF TR1 IS TRIANGLE)
TR2
(THE NAME OF TR2 IS TRIANGLE)

```
TR3
      (THE NAME OF TR3 IS TRIANGLE)
SR1
      (THE NAME OF SR1 IS SQUARE-OR-RECTANGLE)
SR2
      (THE NAME OF SR2 IS SQUARE-OR-RECTANGLE)
SR3
      (THE NAME OF SR3 IS SQUARE-OR-RECTANGLE)
SRP1
      (THE NAME OF SRP1 IS SQUARE-OR-RECTANGLE-IN-PERSPECTIVE)
SRP2
      (THE NAME OF SRP2 IS SQUARE-OR-RECTANGLE-IN-PERSPECTIVE)
SRP3
      (THE NAME OF SRP3 IS SQUARE-OR-RECTANGLE-IN-PERSPECTIVE)
SRP4
      (THE NAME OF SRP4 IS SQUARE-OR-RECTANGLE-IN-PERSPECTIVE)
TRAP1
      (THE NAME OF TRAP1 IS TRAPEZOID)
TRAP2
      (THE NAME OF TRAP2 IS TRAPEZOID)
```

KNOWN OBJECT NAMES

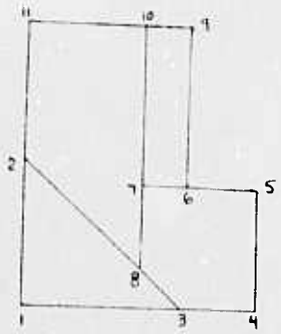
```
TRAPEZOID
SQUARE-OR-RECTANGLE
TRIANGLE
SQUARE-OR-RECTANGLE-IN-PERSPECTIVE
SQUARE
RECTANGLE
LAST
```

GOALS (RAAS)

```
SEO     SEarch Outline
ICO     Incorporate Chunk of Outline
SIO     Scan to Incorporate Outline
TFL     Try for Link
FPL     Find Proposed Link
SEOA    SEarch Outline Again
SNOIL   Start New Object at Inside Link
LIU     Link Inside Unknown
MVIL    Move to Vertex with Inside Link
LIO     Link Inside to Outside
LOV     Link Outside Vertex
SIL     Search for Inside Link
RIO     Recognize Inside Object
IIO     Incorporate Inside Object
IIC     Incorporate Inside Chunk
```

Appendix A.PIC2


```
00100
00200
00300  (PROG2 (SETQ PIC '(
00400
00500       (VER1 V2 (RTA OL) LME DME
00600             UP LE SRA RT UP RTA
00700             UP RT RTA RT DO SRA
00800             NX UP LO VER2
00900             NX RT LO VER3 )
01000
01100
01200       (VER2 TE (UO DR) LME USH
01300             DO RT ACA OR UR OBA UP LE STA
01400             DO LE STA UP RT OBA OR DL ACA
01500             NX DO LO VER1
01600             NX UP ME VER11
01700             NX DR LO VER8  )
01800
01900
02000       (VER3 TE (RL UL) RSH OME
02100             LE UP ACA UL UR OBA RT DO STA
02200             LE DO STA RT UP OBA UL OL ACA
02300             NX UL SH VER8
02400             NX LE LO VER1
02500             NX RT ME VER4 )
02600
02700         A  B  C   D  E
02800       (VER4 V2 (RTA OR) RLO OME
02900             UP LE RTA LE DO SRA ] F
03000             UP RT SRA LE UP RTA
03100             NX LE ME VER3
03200             NX UP ME VER5 ) ] G
03300
03400
03500       (VER5 V2 (RTA UR) RLO ORI
03600             LE DO RTA DO RT SRA
03700             LE UP SRA DO LE RTA
03800             NX DO ME VER4
03900             NX LE ME VER6 )
04000
04100
04200       (VER6 TE (RL UP) RSH ORI
04300             LE UP RTA UP RT RTA RT DO STA
04400             LE DO STA RT UP RTA UP LE RTA
04500             NX LE SH VER7
04600             NX RT ME VER5
04700             NX UP LO VER9 )
04800
04900
05000       (VER7 TE (UO RT) ORI ORI
05100             DO RT RTA RT UP RTA UP LE STA
05200             DO LE STA UP RT RTA RT DO RTA
05300             NX RT SH VER6
05400             NX DO SH VER8
05500             NX UP LO VER10 )
```



A : vertex number (see above)

B : vertex type

C : vertex verbal specification

D + E : position specifications

F : cyclic list of exit direction, internal direction and angle code

G : spatial relationship to other vertices

```
05600
05700
05800       (VER8 TE (DRUL UP) ORI OSH
05900             UL UR ACA UP RT OBA DR DL STA
06000             UL DL STA DR UR OBA UP LE ACA
06100             NX UP SH VER7
06200             NX UL LO VER2
06300             NX DR SH VER3 )
06400
06500
06600       (VER9 V2 (RTA UR) RSH ULO
06700             LE DO RTA DO RT SRA
06800             LE UP SRA DO LE RTA
06900             NX DO LO VER6
07000             NX LE SH VER10 )
07100
07200
07300       (VER10 TE (RL DO) ORI ULO
07400             LE DO RTA DO RT RTA RT UP STA
07500             LE UP STA RT DO RTA DO LE RTA
07600             NX DO LO VER7
07700             NX RT SH VER9
07800             NX LE ME VER11 )
07900
08000
08100       (VER11 V2 (RTA UL) LME ULO
08200             DO RT RTA RT UP SRA
08300             DO LE SRA RT DO RTA
08400             NX DO ME VER2
08500             NX RT ME VER10 )
08600
08700       ))
08800
08900       @PIC2 )
09000
```

Appendix A.RLTM

```
04700  (DEFINE-RLTM
04800
04900
05000
05100
05200  RMN0
05300  RMN1
05400  RMN2
05500  RMN3
05600  RMN4
05700  RMN5
05800  RMN6
05900  RMN7
06000  RMN8
06100  RMN9
06200  RMN10
06300  RMN11
06400  RMN12
06500  RMN13
06600  RMN14
06700  RMN15
06800  RMN16
06900  RMN17
07000  RMN18
07100  RMN19
07200  RMN20
07300  RMN21
07400
07500
07600
07700        (THE RTA OF RMN1 IS RMN2)
07800        (THE ACA OF RMN1 IS RMN3)
07900        (THE OBA OF RMN1 IS RMN4)
08000
08100
08200        (THE RTA OF RMN2 IS RMN5)
08300        (THE ACA OF RMN2 IS RMN6)
08400        (THE UQX OF RMN2 IS SR1)
08500
08600
08700        (THE ACA OF RMN3 IS RMN7)
08800        (THE RTA OF RMN3 IS RMN8)
08900        (THE OBA OF RMN3 IS RMN9)
09000        (THE UQX OF RMN3 IS TR1)
09100
09200
09300        (THE ACA OF RMN4 IS RMN10)
09400        (THE OBA OF RMN4 IS RMN14)
09500
09600
09700        (THE RTA OF RMN5 IS RMN11)
09800        (THE UQX OF RMN5 IS SR2)
09900
10000
```

```
10100        (THE ACA OF RMN6 IS RMN12)
10200        (THE UQX OF RMN6 IS TR3)
10300
10400
10500        (THE ACA OF RMN7 IS RMN13)
10600        (THE RTA OF RMN7 IS RMN12)
10700        (THE OBA OF RMN7 IS RMN18)
10800        (THE UQX OF RMN7 IS TR2)
10900
11000
11100        (THE ACA OF RMN8 IS RMN12)
11200        (THE UQX OF RMN8 IS TR3)
11300
11400
11500        (THE ACA OF RMN9 IS RMN16)
11600        (THE OBA OF RMN9 IS RMN15)
11700        (THE UQX OF RMN9 IS SRP1)
11800
11900
12000        (THE OBA OF RMN10 IS RMN17)
12100        (THE ACA OF RMN10 IS RMN18)
12200        (THE UQX OF RMN10 IS SRP2)
12300
12400
12500        (THE RTA OF RMN11 IS RMN19)
12600        (THE UQX OF RMN11 IS SR3)
12700
12800
12900        (THE COM OF  RMN12 IS TRIANGLE)
13000
13100
13200        (THE COM OF RMN13 IS TRIANGLE)
13300
13400
13500        (THE ACA OF RMN14 IS RMN15)
13600
13700
13800
13900        (THE ACA OF RMN15 IS RMN21)
14000        (THE UQX OF RMN15 IS TRAP1)
14100
14200
14300
14400        (THE OBA OF RMN16 IS RMN20)
14500        (THE COM OF RMN16 IS TRIANGLE)
14600        (THE UQX OF RMN16 IS SRP3)
14700
14800
14900        (THE ACA OF RMN17 IS RMN20)
15000        (THE UQX OF RMN17 IS SRP4)
15100
15200
15300        (THE OBA OF RMN18 IS RMN21)
15400        (THE COM OF RMN18 IS TRIANGLE)
```

```
15600
15700
15800          (THE COM OF RMN19 IS SQUARE-OR-RECTANGLE)
15900
16000
16100          (THE COM OF RMN20 IS SQUARE-OR-RECTANGLE-IN-PERSPECTIVE)
16200
16300
16400          (THE COM OF RMN21 IS TRAPEZOID)
16500
16600
16700
16800
16900
17000  )
17100  (RETURN #PRM)
17200  ]
```

VI-SYS OPERATIONS

BUL - Begin Unknown Line
CAX - Check Attended eXpectation
CEX - Check EXpectation
CUL - Continue Unknown Line
FUL - Finish Unknown Line
PVI - Put Vertex Image in VI
UCPP - Update Current Picture Pointer

INC-SYS OPERATIONS

GOE - Get Object and Environment
GOOE - Get Overlain Object and Environment
GOOEW - Get Overlain Object and Environment Without new start
SFOC - Save First Outside Chunk
SOC - Save Outside Chunk

```
00100
00200 [PROG ()
00300
00400 (SETQ RULES (LIST DEFA
00500
00600
00700 [PROCESS VI-SYS (PS V
00800                  VI9
00900
01000
01100 [RULE VI1 "GET FIRST P
01200       (EQ EXP FI) -->
01300                  (PRI
01400
01500 [RULE VI2 "ONLY DIR IS
01600       (NULL RAN)
01700       (NULL ATT)
01800       (NULL EXP)
01900       (#CPP: $$ NX DIR
02000                  (PRI
02100                  (UCP
02200                  (SET
02300                  (SET
02400                  (PRI
02500
02600 [RULE VI3 "FIRST VERTE
02700       (NULL RAN)
02800       (NULL EXP)
02900       (NULL VI)
03000       (#CPP: $$ NX DIR
03100       (#PIC: $2 $$ (OPP
03200                  (PRI
03300                  (UCP
03400                  (BUL
03500
03600 [RULE VI4 "FIRST ATT S
03700       (NULL RAN)
03800       (NULL EXP)
03900       (NULL VI)
04000       (#CPP: $$ NX DIR
04100                  (PRI
04200                  (UCP
04300                  (SET
04400                  (SET
04500                  (PRI
04600
04700 [RULE VI5 "ANOTHER ST
04800       (NULL RAN)
04900       (NULL EXP)
05000       (#CPP: $$ NX DIR
05100       (#PIC: $2 $$ (OPP
05200                  (UCP
05300                  (CUL
05400
05500 [RULE VI6 "END OF ATT
```

A. VI-SYS

```
00100
00200  [PROG ()
00300
00400  (SETQ RULES (LIST DEFAULT))
00500
00600
00700  [PROCESS VI-SYS (PS VI1 VI2 VI3 VI4 VI5 VI6 VI7 VI8
00800                  VI9 VI10 VI11 VI12) ]
00900
01000
01100  [RULE VI1 "GET FIRST PICTURE VIEW"
01200        (EQ EXP FI) ==> (SETQ VI (PVI) )
01300                        (PRINT-VR)  (DEACT)          ]
01400
01500  [RULE VI2 "ONLY DIR IS SPECIFIED"
01600        (NULL RAN)
01700        (NULL ATT)
01800        (NULL EXP)
01900        (#CPP: $$ NX DIR $1 $2) ==>
02000                     (PRINT-VR)
02100                     (UCPP $2)
02200                     (SETQ RAN $1)
02300                     (SETQ VI (PVI))
02400                     (PRINT-VR)  (DEACT)        ]
02500
02600  [RULE VI3 "FIRST VERTEX HAS STRAIGHT ATT SIDE"
02700        (NULL RAN)
02800        (NULL EXP)
02900        (NULL VI)
03000        (#CPP: $$ NX DIR $1 $2 )
03100        (#PIC: $2 $$ (OPPO OF DIR) ATT STA ) ==>
03200                     (PRINT-VR)
03300                     (UCPP $2)
03400                     (BUL)          ]
03500
03600  [RULE VI4 "FIRST ATT SIDE NOT STRAIGHT"
03700        (NULL RAN)
03800        (NULL EXP)
03900        (NULL VI)
04000        (#CPP: $$ NX DIR $1 $2) ==>
04100                     (PRINT-VR)
04200                     (UCPP $2)
04300                     (SETQ RAN $1)
04400                     (SETQ VI (PVI) )
04500                     (PRINT-VR)  (DEACT)          ]
04600
04700  [RULE VI5 "ANOTHER STRAIGHT ATT SIDE"
04800        (NULL RAN)
04900        (NULL EXP)
05000        (#CPP: $$ NX DIR $1 $2)
05100        (#PIC: $2 $$ (OPPO OF DIR) ATT STA)  ==>
05200                     (UCPP $2)
05300                     (CUL)        ]
05400
05500  [RULE VI6 "END OF ATT SCANNED LINE"
```

```
05600        (NULL RAN)
05700        (NULL EXP)
05800        (*CPP: $$ NX DIR $1 $2) ==>
05900                    (UCPP $2)
06000                    (FUL)
06100                    (PRINT-VR) (DEACT          ]
06200
06300   [RULE V17 "ONLY EXP SPECIFIED"
06400        (NULL RAN)
06500        (NULL ATT)
06600        (*CPP: $$ NX DIR $1 $2) ==>
06700                    (PRINT-VR)
06800                    (UCPP $2)
06900                    (SETQ RAN $1)
07000                    (SETQ VI (PVI))
07100                    (SETQ EXP (CEX))
07200                    (PRINT-VR) (DEACT)        ]
07300
07400   [RULE V18 "ATT & EXP SPECIFIED AND STRAIGHT ATT SIDE"
07500        (NULL RAN)
07600        (NULL VI)
07700        (*CPP: $$ NX DIR $1 $2)
07800        (*PIC: $2 $$ (OPPO OF DIR) ATT STA) ==>
07900                    (PRINT-VR)
08000                    (UCPP $2)
08100                    (BUL)        ]
08200
08300   [RULE V19 "EXP & ATT & NO STRAIGHT SIDES FOUND"
08400        (NULL RAN)
08500        (NULL VI)
08600        (*CPP: $$ NX DIR $1 $2) ==>
08700                    (PRINT-VR)
08800                    (UCPP $2)
08900                    (SETQ RAN $1)
09000                    (SETQ VI (PVI))
09100                    (SETQ EXP (CAX))
09200                    (PRINT-VR) (DEACT)        ]
09300
09400   [RULE V110 "EXP & ATT & STRAIGHT SIDE FOUND"
09500        (NULL RAN)
09600        (*CPP: $$ NX DIR $1 $2)
09700        (*PIC: $2 $$ (OPPO OF DIR) ATT STA) ==>
09800                    (UCPP $2)
09900                    (CUL)        ]
10000
10100   [RULE V111 "EXP & ATT & END OF LINE"
10200        (NULL RAN)
10300        (*CPP: $$ NX DIR $1 $2) ==>
10400                    (UCPP $2)
10500                    (FUL)
10600                    (SETQ EXP (CAX))
10700                    (PRINT-VR) (DEACT)        ]
10800
10900   [RULE V112 "MOVE OFF LINES FAITH ALL THE WAY"
11000        (NULL RAN)
```

```
11100       (NULL ATT)
11200       (#CPP $$ AX DIR $1 $2) #=>
11300                  (PRINT-VR)
11400                  (UCPP $2)
11500                  (SETQ RAN $1)
11600                  (SETQ VI (PV))
11700                  (SETQ EXP (GEX))
11800                  (PRINT-VR) (DEACT)      ]
11900
12000       (RETURN #R) ]
```

```
[PROG ()

]

"PROCESS INC-SYS
        (PS I21 I22 INCO  IO1 IO2 IO11 IO12 IOO11 IOO12
            IOK1 IOK2 IOU1 IOU2 IICO1 IICO2
            IIC1 IIC2 IIO1 IIO2  )
]

[RULE I21 "INCORPORATE FIRST OBJECT"
      (NULL ITM)
      (#1: GOL $1)
      ((NAME OF GOL) = I2D) ==>   (PRINT-ITM)
                        (ALTER #1: GOL ← )
                        (ITM ← (GOE #1: $1 (CR OF GOL)))
                        (FIRST-OB ← (CAAR ITM))
                        (NEW #3: GOL)
                        (PUTPROP GOL SNO NAME)
                        (PRINT-ITM)  (DEACT)
]

[RULE IO1 "INCORPORATE FIRST OBJECT WHICH IS OVERLAY"
      (NULL ITM)
      (#1: GOL $1)
      ((NAME OF GOL) = "LO) ==>   (PRINT-ITM)
                        (ALTER #1: GOL ← )
                        (ITM ← (GOOE #1: $1 (PR OF GOL)))
                        (FIRST-OB ← (CAAR ITM))
                        (NEW #3: GOL)
                        (PUTPROP GOL SNO NAME)
                        (PRINT-ITM)  (DEACT)
]

[RULE I22 "INCORPORATE  ANOTHER OBJECT"
      (#1: GOL $1)
      ((NAME OF GOL) = I20)
                  ==> (PRINT-ITM)
                        (ALTER #1: GOL ← )
                        (ITM ← (NCONC  ITM (GOE #1: $1 (CR OF GOL))))
                        (NEW #3: GOL)
                        (PUTPROP GOL SNO NAME)
```

```
05600                       (PRINT-ITM) (DEACT)
05700  ]
05800
05900
06000
06100
06200
06300
06400  [RULE 102 "INCORPORATE ANOTHER OBJECT OVERLAIN"
06500       (●1: GOL $1)
06600       ((NAME OF GOL) = 120)
06700                   ==> (PRINT ITM)
06800                       (ALTER ●1: GOL + )
06900                       (ITM + (NCONC ITM (GOOE ●1: $1 (PR OF GOL))))
07000                       (NEW ●3: GOL)
07100                       (PUTPROP GOL SNO NAME)
07200                       (PRINT-ITM) (DEACT)
07300  ]
07400
07500
07600
07700
07800  [RULE 101 "INCORPORATE NEW OBJECT BEFORE REC NEW OBJECT"
07900       (NULL ITM)
08000       (●1: GOL $1)
08100       ((NAME OF GOL) = 101) ==>   (PRINT-ITM)
08200                       (ALTER ●1: GOL + )
08300                       (ITM + (GOOEW ●1: $1 (PR OF GOL)))
08400                       (FIRST-OB + (CAAR ITM))
08500                       (NEW ●3: GOL)
08600                       (PUTPROP GOL RNO NAME)
08700                       (REMPROP GOL LINK)
08800                       (PRINT-ITM) (DEACT)
08900  ]
09000
09100
09200  [RULE 1012 "INCORPORATE OVERLAY OBJECT"
09300       (●1: GOL $1)
09400       ((NAME OF GOL) = 101) ==>   (PRINT-ITM)
09500                       (ALTER ●1: GOL + )
09600                       (ITM + (NCONC ITM (GOOEW ●1: $1 (PR OF GOL))))
09700                       (REMPROP GOL LINK)
09800                       (NEW ●3: GOL)
09900                       (PUTPROP GOL RNO NAME)
10000                       (PRINT-ITM) (DEACT)
10100  ]
10200
10300
10400
10500  [RULE 1001 "INCORPORATE NEW OBJECT BEFORE REC NEW OBJECT"
10600       (NULL ITM)
10700       (●1: GOL $1)
10800       ((NAME OF GOL) = 100) ==>   (PRINT-ITM)
10900                       (ALTER ●1: GOL + )
11000                       (ITM + (GOOEW ●1: $1 (PR OF GOL)))
```

```
11100                       (FIRST-OB ← (CAAR ITM))
11200                       (NEW #3: GOL)
11300                       (PUTPROP GOL TOX2 NAME)
11400                       (PRINT-ITM) (DEACT)
11500 ]
11600
11700
11800 [RULE 1002 "INCORPORATE OVERLAY OBJECT"
11900       #1: GOL $1)
12000       ((NAME OF GOL) = 1002) ==>   (PRINT-ITM)
12100                       (ALTER #1: GOL ← )
12200                       (ITM ← (NCONC ITM (GODEW #1: $1 (PR OF GOL))))
12300                       (NEW #3: GOL)
12400                       (PUTPROP GOL TOX2 NAME)
12500                       (PRINT-ITM) (DEACT)
12600 ]
12700
12800
12900 [RULE 10K1 "INCORPORATE OVERLAY OBJECT KNOWING OVERLAYING OBJECT"
13000       #1: GOL $1)
13100       ((NAME OF GOL) = 10K)
13200       (NULL ITM)
13300       (#2: OGOL $2)  ==>   (PRINT-ITM)
13400                   (ALTER #2: OGOL ← )
13500                   (ITM ← (GODEW #2: $2 (PR OF OGOL)))
13600                   (FIRST-OB ← (CAAR ITM))
13700                   (UNMARK #1: )
13800                   (MMC #1: (CR OF GOL))
13900                   (PUTPROP GOL SK2C NAME)
14000             (PRINT-ITM) (DEACT)
14100 ]
14200
14300 [RULE 10K2 "INCORPORATE OVERLAY OBJECT KNOWING OVERLAYING OBJECT"
14400       (#1: GOL $1)
14500       ((NAME OF GOL) = 10K)
14600       #2: OGOL $2)  ==>   (PRINT-ITM)
14700                   (ALTER #2: OGOL ← )
14800                   (ITM ← (NCONC ITM (GODEW #2: $2 (PR OF OGOL))))
14900                   (UNMARK #1: )
15000                   (MMC #1: (CR OF GOL))
15100                   (PUTPROP GOL SK2C NAME)
15200             (PRINT-ITM) (DEACT)
15300 ]
15400
15500 [RULE 10U1 "INCORPORATE OVERLAY OBJECT KNOWING OVL  AYING OBJECT"
15600       (#1: GOL $1)
15700       ((NAME OF GOL) = 10U)
15800       (NULL ITM)
15900       (#2: OGOL $2)  ==>   (PRINT-ITM)
16000                   (ALTER #2: OGOL ← )
16100                   (ITM ← (GODEW #2: $2 (PR OF OGOL)))
16200                   (FIRST-OB ← (CAAR ITM))
16300                   (PUTPROP GOL PUC NAME)
16400                   (PRINT-ITM) (DEACT)
16500 ]
```

```
16600
16700
16800
16900
17000  [RULE IOU2 "INCORPORATE OVERLAY OBJECT KNOWING OVERLAYING OBJECT"
17100        (=1: GOL $1)
17200        ((NAME OF GOL) = IOU)
17300        (=2: OGOL $2)  ==>   (PRINT-ITM)
17400                     (ALTER =2: OGOL ← )
17500                     (ITM ← (NCONC ITM (GOOEW =2: $2 (PR OF OGOL))))
17600                     (PUTPROP GOL RUC NAME)
17700                     (PRINT-ITM)  (DEACT)
17800  ]
17900
18000
18100
18200
18300
18400
18500
18600  [RULE IICO1 "REHEARSE FIRST OUTSIDE CHUNK"
18700        (=1: LAST GOL )
18800        ((NAME OF GOL) = ICO)
18900                     ==> (PRINT-ITM)
19000                          (SFOC =1:)
19100                          (PRINT-ITM)  (DEACT)
19200  ]
19300
19400
19500
19600  [RULE IICO2 "REHEARSE ANOTHER OUTSIDE CHUNK"
19700        (=1: GOL)
19800        ((NAME OF GOL) = ICO)
19900        (=2: LAST)
20000                     ==> (PRINT-ITM)
20100                          (SOC =2:)
20200                          (PRINT-ITM)  (DEACT)
20300  ]
20400
20500
20600  [RULE IIC1 "INCORPORATE AN INSIDE CHUNK"
20700        (=1: GOL $1)
20800        ((NAME OF GOL) = IIC)
20900        ((TYPE OF $1) = ILINE)
21000        (=2: LAST $2)
21100                     ==> (PRINT-ITM)
21200                          (ALTER =2: LAST ←)
21300                          (ITM ← (NCONC ITM (CDR =2:)))
21400                          (LAST-ITM ← $2)
21500                          (PUTPROP GOL IIO NAME)
21600                          (PRINT-ITM)  (DEACT)
21700  ]
21800
21900  [RULE IIC2 "INCORPORATE AN INSIDE CHUNK"
22000        (=1: GOL )
```

```
22100        ((NAME OF GOL) = IIC)
22200        (#2: LAST $2)
22300                    ==> (PRINT-ITM)
22400                        (ALTER #2: LAST ←)
22500                        (ITM ← (NCONC ITM (CDR #2:)))
22600                        (PUTPROP GOL SIL NAME)
22700                        (PRINT-ITM) (DEACT)
22800  ]
22900
23000
23100
23200
23300
23400  [RULE IIO1 "INCORPORATE FIRST INSIDE OBJECT"
23500        (#1: GOL $1)
23600        ((NAME OF GOL) = IIO)
23700        (#2: $2 OGOL)
23800        (NULL FIRST-OB)
23900                    ==> (PRINT-ITM)
24000                        (ALTER #2: OGOL ←)
24100                        (ALTER #1: GOL ←)
24200                        (ITM ← (NCONC ITM (GOEW #1: $1 (CR OF GOL))))
24300                        (FIRST-OB ← (LAST-OB ← $1))
24400                        (LAST-ITM ← $1)
24500                        (PUTPROP GOL (NAME OF OGOL) NAME)
24600                        (RESETICH)
24700                        (PRINT-ITM) (DEACT)
24800  ]
24900
25000
25100
25200
25300
25400  [RULE IIO2 "INCORPORATE  INSIDE OBJECT"
25500        (#1: GOL $1)
25600        ((NAME OF GOL) = IIO)
25700        (#2: $2 OGOL)
25800                    ==> (PRINT-ITM)
25900                        (ALTER #2: OGOL ←)
26000                        (ALTER #1: GOL ←)
26100                        (ITM ← (NCONC ITM (GOEW #1: $1 (CR OF GOL))))
26200                        (LAST-OB ← $1)
26300                        (LAST-ITM ← $1)
26400                        (PUTPROP GOL (NAME OF OGOL) NAME)
26500                        (RESETICH)
26600                        (PRINT-ITM) (DEACT)
26700  ]
26800
26900
27000
27100  [RULE  INCO "LAST INCORPORATE  ELIMINATE TE VERTICES"
27200        (#1: GOL)
27300        ((NAME OF GOL) = NOMO)
27400                    ==> (PRINT-ITM)
27500                        (FARLT )
```

```
27500                          (PRINT-ITM)
27600                          (DEACT)
27700   )
27800
27900   (RETURN @RING)
28000   )
28100
```

REC-SYS OPERATIONS

PRN - Prepare and Recognize New
RIC - Recognize Inside object Complete
RKI - Recognize Known Interrupted
RNC - Recognize New object Complete
RNU - Recognize New object Unfinished
ROI - Recognize Overlain Interrupted
ROKI - Recognize Overlaying Known Interrupted
ROU - Recognize Overlaying Incomplete
RTAA - Recognize Traversal of Angle from an ANGLE
RTAX - Recognize Traversal of Angle from XIT
RTLA - " " of Line from ANGLE
RTLE - " " of Line from END
RTLX - " " of Line from XIT
RTOA - " " of Object from ANGLE
RTOO - " " of Object from Overlay cutoff
RTOFO - " " of Object from FACE or OBJECT
RTOS - " " of Object from SIDE
RTSA - " " of Side from ANGLE
RTSE - " " of Side from END
RTSX - " " of Side from XIT
TFO - Try For Overlay
UCM - Update to Complete Model

```
00100
00200
00300  [PROG ()
00400
00500
00600
00700
00800   PROCESS REC-SYS
00900                (PS PE
01000
01100
01200
01300
01400
01500
01600
01700  [RULE REC1 "NO MO
01800        (#1: GOL $1)
01900        ((NAME OF GO
02000        ((LINK OF GOL
02100        (#2: COM)
02200
02300  ]
02400
02500
02600  [RULE REC2 "OBJECT
02700        (#1: GOL $1)
02800        ((NAME OF GO
02900        ((LINK OF GOL
03000        (#2: COM)
03100
03200
03300  ]
03400
03500
03600
03700  [RULE REC3 "ENTER
03800        (#1: GOL)
03900        (NAME-OF-GO
04000        (LINK OF GOL)
04100        (#2: $1 (HAS R
04200        ((TYPE OF $1
04300        ((TYPE OF (LIN
04400
04500  ]
04600
04700
04800  [RULE REC4 "ENTER
04900        (#1: GOL)
05000        (NAME-OF-GOL
05100        (LINK OF GOL)
05200        (#2: $1 (HAS R
05300        ((TYPE OF $1
05400
05500  ]
```

A. REC-SYS

```
00100
00200
00300 [PROG ()
00400
00500
00600
00700
00800 [PROCESS REC-SYS
00900          (PS REC0 RKI1 ROI1 RIC1 ROU1 ROKI1 REC1 REC2 REC3 REC4 REC5 REC6 REC7 REC8
01000              REC10 REC11 REC12 REC13 REC14 REC15 REC16
01100              RUC1 RUC2 RUC3 RUC4 RUC5) ]
01200
01300
01400
01500
01600
01700 [RULE REC1 "NO MORE MEMORY INFORMATION"
01800       (#1: GOL $1)
01900       ((NAME OF GOL) = RNO)
02000       ((LINK OF GOL) = UQX)
02100       (#2: COM)      ==>
02200                      (RNU #1: $1 #2:)
02300 ]
02400
02500
02600 [RULE REC2 "OBJECT COMPLETELY SCANNED IN MEMORY"
02700       (#1: GOL $1)
02800       ((NAME OF GOL) = RNO)
02900       ((LINK OF GOL) = COM)
03000       (#2: COM)      ==>
03100                      (ALTER #2: COM +)
03200                      (RNC #1: $1)
03300 ]
03400
03500
03600
03700 [RULE REC3 "ENTER VERTEX BY ANGLE"
03800       (#1: GOL)
03900       (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
04000       (LINK OF GOL)
04100       (#2: $1 (HAS RESULT))
04200       ((TYPE OF  $1 ) = VERTEX)
04300       ((TYPE OF (LINK OF GOL)) = KEA) ==>
04400                      (RTAA (PDIR OF GOL) (LINK OF GOL))
04500 ]
04600
04700
04800 [RULE REC4 "ENTER VERTEX BY XIT "
04900       (#1: GOL)
05000       (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
05100       (LINK OF GOL)
05200       (#2: $1 (HAS RESULT))
05300       ((TYPE OF  $1 ) = VERTEX) ==>
05400                      (RTAX (PDIR OF GOL) (LINK OF GOL))
05500 ]
```

```
05600
05700
05800
05900  [RULE REC5 "ENTER SIDE AT AN END"
06000        (#1: GOL)
06100        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
06200        (LINK OF GOL)
06300        (#2: $1 (HAS RESULT))
06400        ((TYPE OF  $1 ) = SIDE)
06500        ((TYPE OF  (LINK OF GOL)) = SID) ==>
06600                        (RTSE (PDIR OF GOL) (LINK OF GOL) )
06700 .
06800
06900  ]
07000
07100  [RULE REC6 "ENTER SIDE AT AN ANGLE"
07200        (#1: GOL)
07300        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
07400        (LINK OF GOL)
07500        (#2: $1 (HAS RESULT))
07600        ((TYPE OF  $1 ) = SIDE)
07700        ((TYPE OF (LINK OF GOL)) = KEA) ==>
07800                        (RTSA (PDIR OF GOL) (LINK OF GOL))
07900
08000  ]
08100
08200
08300  [RULE REC7 "ENTER SIDE AT AN XIT"
08400        (#1: GOL)
08500        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
08600        (LINK OF GOL)
08700        (#2: $1 (HAS RESULT))
08800        ((TYPE OF  $1 ) = SIDE) ==>
08900                        (RTSX (PDIR OF GOL) (LINK OF GOL))
09000
09100 ·]
09200
09300
09400  [RULE REC8 "ENTER LINE AT END"
09500        (#1: GOL)
09600        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
09700        (LINK OF GOL)
09800        (#2: $1 (HAS RESULT))
09900        ((TYPE OF  $1 ) = LINE)
10000        ((TYPE OF (LINK OF GOL)) = LIN) ==>
10100                        (RTLE (PDIR OF GOL) (LINK OF GOL))
10200
10300  ]
10400
10500  [RULE REC9 "ENTER LINE AT AN ANGLE"
10600        (#1: GOL)
10700        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
10800        (LINK OF GOL)
10900        (#2: $1 (HAS RESULT))
11000        ((TYPE OF  $1 ) = LINE)
11100        ((TYPE
11200
11300
11400  ]
11500
11600  [RULE REC10
11700        (#1: GO
11800        (NAME-
11900        (LINK O
12000        (#2: $1
12100        ((TYPE
12200
12300
12400  ]
12500
12600  [RULE REC11
12700        (#1: GO
12800        (NAME-
12900        (LINK O
13000        (#2: $1
13100        ((TYPE
13200        ((TYPE
13300
13400
13500  ]
13600
13700  [RULE REC12
13800        (#1: GO
13900        (NAME-
14000        (LINK O
14100        (#2: $1
14200        ((TYPE
14300        ((TYPE
14400
14500
14600  ]
14700
14800  [RULE REC13
14900        (#1: GO
15000        (NAME-
15100        (LINK O
15200        (#2: $1
15300        ((TYPE
15400        ((TYPE
15500
15600
15700  ]
15800
15900  [RULE REC14
16000        (#1: GO
16100        (NAME
16200        (LINK O
16300        (#2: $1
16400        ((TYPE
16500        (((TYPE
```

```
11100         ((TYPE OF (LINK OF GOL)) = KEA) ==>
11200                         (RTLA (PDIR OF GOL) (LINK OF GOL))
11300
11400   ]
11500
11600   [RULE REC10 "ENTER LINE AT AN XIT"
11700         (=1: GOL)
11800         (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
11900         (LINK OF GOL)
12000         (=2: $1 (HAS RESULT))
12100         ((TYPE OF  $1 ) = LINE) ==>
12200                         (RTLX (PDIR OF GOL) (LINK OF GOL))
12300
12400   ]
12500
12600   [RULE REC11 "ENTER OBJECT FROM SIDE"
12700         (=1: GOL)
12800         (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
12900         (LINK OF GOL)
13000         (=2: $1 (HAS RESULT))
13100         ((TYPE OF  $1 ) = OBJECT)
13200         ((TYPE OF (LINK OF GOL)) = INS) ==>
13300                         (RTOS (PDIR OF GOL) (LINK OF GOL))
13400
13500   ]
13600
13700   [RULE REC12 "ENTER OBJECT AT AN ANGLE"
13800         (=1: GOL)
13900         (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
14000         (LINK OF GOL)
14100         (=2: $1 (HAS RESULT))
14200         ((TYPE OF  $1 ) = OBJECT)
14300         ((TYPE OF (LINK OF GOL)) = KEA) ==>
14400                         (RTOA (PDIR OF GOL) (LINK OF GOL))
14500
14600   ]
14700
14800   [RULE REC13 "ENTER OBJECT AT OVERLAY CUTOFF"
14900         (=1: GOL)
15000         (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
15100         (LINK OF GOL)
15200         (=2: $1 (HAS RESULT))
15300         ((TYPE OF  $1 )  OBJECT)
15400         ((TYPE OF (LINK OF GOL)) = IOC) ==>
15500                         (RTOO (PDIR OF GOL) (LINK OF GOL))
15600
15700   ]
15800
15900   [RULE REC14 "ENTER OBJECT FROM ANOTHER OBJECT OR FACE"
16000         (=1: GOL)
16100         (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO)
16200         (LINK OF GOL)
16300         (=2: $1 (HAS RESULT))
16400         ((TYPE OF  $1 ) = OBJECT)
16500         (((TYPE OF  (LINK OF GOL)) = INO)  OR
```

```
                (TYPE OF (LINK OF GOL)) = INF)) =>
                        (PTOFD (PDIR OF GOL) (LINK OF GOL))

]


[RULE REC15 "LOOK IN TIM FOR NEEDED MEMORY"
        (=: GOL)
        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO
        (LINK OF GOL)
        (NEED =: $1 (HAS RESULT)) =>
                        (PUTPROP $1 (LINK OF GOL) CR)

]

[RULE REC16 "HAVE FORGOTTEN THE REST NEEDED"
        (=: GOL)
        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO
                =>
                        (PUTPROP GOL UOX LINK)

]


[RULE REC0 "BEGIN RECOGNITION OF NEW OBJECT"
        (=: GOL)
        (NAME-OF-GOL-IS-RNO-OR-ROO-OR-RIO
        (NULL (LINK OF GOL))
        (=2: LAST $1)
                =>
                        (=2: LAST ←)
                        (PR% $1 (PDIC OF GOL) =2: =1)

]


[RULE RUC "POSSIBLE OVERLAY IN COMPLETED OBJECT"
        (=: GOL $1)
        ((NAME OF GOL) = RUC)
        (NOT (NULL (NUMS OF $1)))
        ((PR OF GOL) = (CR OF GOL))
        (NULL (COM OF CRAP))
        ((SIZE OF (PDIR OF GOL) OF (CR OF GOL)) = YES)
                =>
                        (TTO =: $1)
```

```
22100  ]
22200
22300
22400
22500  [RULE RUC2 "RECOGNIZE AN N-SIDED OBJECT"
22600        (#1: GOL $1)
22700        ((NAME OF GOL) = PUC)
22800        (NOT (NULL (NUMS OF $1)))
22900        ((PR OF COL) = (CR OF GOL))
23000        (NULL (COM OF CRMP))
23100                    ==>
23200                    (PUTPROP $1 SIDED NAME)
23300                    (PUTPROP (CR OF GOL) YES MARK)
23400                    (PUTPROP ((DIV1 OF (CR OF GOL)) OF (CR OF GOL)) YES MARK)
23500                    (PUTPROP GOL ((DIV1 OF (CR OF GOL)) OF  ((DIV1 OF (CR OF GOL)) OF (CR OF (
23600                    (PUTPROP (CR OF GOL) YES MARK)
23700                    (PUTPROP GOL SK2C NAME)
23800                    (DEACT)
23900  ]
24000
24100
24200
24300  [RULE RUC3 "RECOGNIZE A KNOWN OBJECT"
24400        (#1: GOL $1)
24500        ((NAME OF GOL) = RUC)
24600        (NOT (NULL (NUMS OF $1)))
24700        ((PR OF GOL) = (CR OF GOL))
24800                    ==>
24900                         (PUTPROP $1 (COM OF CRMP) NAME)
25000                         (REMPROP $1 NUMS)
25100                    (PUTPROP (CR OF GOL) YES MARK)
25200                    (PUTPROP ((DIV1 OF (CR OF GOL)) OF (CR OF GOL)) YES MARK)
25300                    (PUTPROP GOL ((DIV1 OF (CR OF GOL)) OF  ((DIV1 OF (CR OF GOL)) OF (CR OF (
25400                    (PUTPROP (CR OF GOL) YES MARK)
25500                    (PUTPROP GOL SK2C NAME)
25600                    (DEACT)
25700  ]
25800
25900
26000
26100  [RULE RUC4 "REVIEW A CORNER OF MODEL"
26200        (#1: GOL $1)
26300        ((NAME OF GOL) = RUC)
26400        (#2: $2 (HAS (EAL OF ((DIV. OF (CR OF GOL)) OF (CR OF GOL)))))
26500                    ==>
26600                         (UCM (EAL OF ((DIV1 OF (CR OF GOL)) OF (CR OF GOL))) $2)
26700                         (PUTPROP $1 (ADD-ONE (NUMS OF $1)) NUMS)
26800  ]
26900
27000
27100
27200  [RULE RUC5 "I'AVE FORGOTTEN A CORNER ANGLE"
27300        (#1: GOL $1)
27400        ((NAME OF GOL) = RUC)
27500                    ==>
```

```
                        (DEACT)
]


[RULE RK11 "A KNOWN GOAL INTERRUPT CAUSES RE-RECOGNITION"
      (#1: GOL $1)
      ((NAME OF GOL) = RK1)
                  ==>
                        (RK1 #1: $1)
]


[RULE RO11 " A OVERLAY GOAL INTERRUPT CAUSES RE-RECOGNITION"
      (#1: GOL $1)
      ((NAME OF GOL) = RO1)
                  ==>
                        (RO1 #1: $1)
]


[RULE RIC1 "COMPLETE MEMORY SCAN FOR INSIDE OBJECT"
      (#1: GOL $1)
      ((NAME OF GOL) = RIO)
      ((LINK OF GOL) = COM) ==>
                        (RIC #1: $1)
]

[RULE RIC2 "INCOMPLETE INSIDE OBJECT SO FORGOTTEN"
      (#1: GOL $1)
      ((NAME OF GOL) = RIO)
      ((LINK OF GOL) = UQX)
      (#2: $2 OGOL)
                  ==>
                        (ALTER #1: GOL ←)
                        (ALTER #2: OGOL ←)
                        (PUTPROP GOL (NAME OF OGOL) NAME)
                        (RESETICH)
                        (DEACT)
]

[RULE ROU1 "NO MORE MEMORY TO RECOGNIZE OVERLAYING OBJECT"
      (#1: GOL $1)
      ((NAME OF GOL) = ROO)
      ((LINK OF GOL) = UQX) ==>
                        (ROU #1: $1 )
]
```

```
33100  [RULE ROK11 "A WRONG VERTEX CAUSES RE-RECOGNITION OF OVERLAYING OBJECT"
33200        (#1: GOL $1)
33300        ((NAME OF GOL) = ROK1)
33400                    ==>
33500                         (ROK1 #1: $1)
33600  ]
33700
33800  (RETURN &RREC)
33900  ]
34000
```

General Rule Functions

(STM! VI)	- place the contents of VI into STM as a new chunk
(#2: ← NEW-STM)	loes the same as above, but locally assigns #2: to reference that new chunk
(ALTER #1: YY ·)	- remove YY from the head of chunk #1:
(ALTER #1: < YY)	- append YY to the head of chunk #1:
(ALTER #1: XX < YY)	- change XX to YY at the head of c unk #1:
(PUTPF P GOL XXX NAME)	- a goal transition, changing the name of GOL
(DEACT)	- deact this currently active process
(* XXX)	- activate process XXX
(NEW #1: ....)	- creates a new STM chunk referenced by #1: from the list of elements ....

AMO	- Accom
MSL	- Make
MEA	- Move
AMV	- Accom
UMM	- Updat
ICP	- Incor
COS	- Conne
MSF	- Made
MSC	- Make
IOR	- Incor
MCR	- Move
MSB	- Make
UUM	- Updat
UPDP	- Updat
MEX	- Move
VRNULL	- Set a
MFL	- Move
MLO	- Make
FLO	- Finis
MFO	- Move
ENL	- Enter
MAEX	- Move
MOL	- Move
EVLL	- Enter
UIR	- Updat
CAC	- Check

RAA

AMO - Accomodate Model for Overlay
MSL - Make Side from Line
MEA - Move with Expectation and Attention
AMV - Accomodate Model for Vertex
UMM - Update and Mark Model
ICP - Incorporate Current Position
COS - Connect Outline Side
MSF - Made Side Finish
MSC - Make Side Continue
IOR - Incorporate Observed Range
MCR - Move from Current Reference (of GOL)
MSB - Make Side Begin
UUM - Update Unknown Model
UPDP - Update Prime Direction and Position
MEX - Move with EXpectation
VRNULL - Set all of Visual Register to NULL
MFL - Move For LINE
MLO - Make Line for Overlay
FLO - Finish Line for Overlay
MFO - Move For Overlay
ENL - Enter New Link
MAEX - Move According to EX-XIT
MOL - Move Over Line
EVLL - Enter Vertex Linked to Line
UIR - Update Internal Range
CAC - Check if At Com-appended chunk (complete)

A . RAA

```
00100                                                                                                   05600
00200  [PROG ()                                                                                         05700
00300                                                                                                   05800
00400                                                                                                   05900
00500  [PROCESS AA-SYS                                                                                  06000  ]
00600           (PS RAA00 RAA0 SN0000 SN000 SN00 SNM01 S0C1                                              05100
00700                   SK2C1 SK021 SK0021 SU020 SU021 SU0021 S00C1                                       06200
00800                   K021 K022 K023 K0023 K024 K0024 K025 K026 K0026                           05300  [RU
00900                   K027 K0027 K028 K029 K0210 K0211 U021                                            06400
01000                   U0021 U022 U0022 U023 U0023 U024 U0024                                            06500
01100                   U025 U026 U027 U028 U0C. K2C1 K2C2 K2C3 K2C4                                     06600
01200                   K2C5 K2C6 K2C7 K2C8 K2C9 K2C10 K2C11 K2C12                                       06700
01300                   0021 0022 0023 0024 0025 0026 0027 0028                                          06800
01400                   0029 00210 00211 00212 00213                                                     06900
01500                   TOL1 TOL2 TOL3 TOL4 TOX11 TOX12 TOX13 TOX14                                      07000
01600                   TOX15 TOL41 TOL42 TOL43 TOX21 TOX22 TOX23                                        07100
01700                   TOX24 TOX25 TOLL1  )                                                             07200
01800  ]                                                                                                07300  ]
01900                                                                                                   07400
02000                                                                                                   07500
02100                                                                                                   07600
02200  [RULE K021 "TE GIVES OVERLAY WITH NEW SIDE"                                                      07700
02300        (#1: GOL $1 )                                                                              07800
02400        ((NAME OF GOL) = K02)                                                                      07900
02500        (EXP = NO)                                                                                 05000  [RU
02600        ((SPEC OF (VER OF (VI-REF))) = TE)                                                         08100
02700        (NOT (((ANG OF (ATT OF (CR OF (VI-REF)))) = STA) OR                                        08200
02800                   ((ANG OF ((OPPO OF ATT) OF (CR OF (VI-REF)))) = STA)))                          08300
02900        ((TYPE OF (VI-REF)) = LINE) ==>                                                            08400
03000                   (AMO #1: $1 (CR OF GOL) (CR OF (VI-REF)))                                       08500
03100                   (MSL (CR OF (VI-REF)) (LIK OF (CR OF GOL)) (CR OF GOL))                         08600
03200                   (PUTPROP (CR OF GOL) IOS TYPE)                                                  08700
03300                   (PUTPROP (VI-REF) (ATT OF (ATT OF (CR OF (VI-REF)))) CR)                        08800
03400                   (#2: ← (NEW-STM))                                                               08900  ]
03500                   (ALTER #2: < COM)                                                               09000
03600                   (PUTPROP GOL 002 NAME)                                                          09100
03700                   (MEA)                                                                           09200  [RU
03800                   (◂ VI-SYS)                                                                      09300
03900  ]                                                                                                09400
04000                                                                                                   09500
04100                                                                                                   09600
04200                                                                                                   09700
04300                                                                                                   09800
04400  [RULE K022 "TE GIVES OVERLAY"                                                                    09900
04500        (#1: GOL $1)                                                                               10000  ]
04600        ((NAME OF GOL) = K02)                                                                      10100
04700        (EXP = NO)                                                                                 10200
04800        ((SPEC OF (VI-REF)) = TE)                                                                  10300  [RU
04900        (NOT (((ANG OF (ATT OF (CR OF (VI-REF)))) = STA) OR                                        10400
05000                   ((ANG OF ((OPPO OF ATT) OF (CR OF (VI-REF)))) = STA))) ==>                      10500
05100                   (AMO #1: $1 (CR OF GOL) (CR OF (VI-REF)))                                       10600
05200                   (PUTPROP (VI-REF) (ATT OF (ATT OF  (CR OF (VI-REF)))) CR)                       10700
05300                   (#2: ← (NEW-STM))                                                               10800
05400                   (ALTER #2: < COM)                                                               10900
05500                   (PUTPROP GOL 002 NAME)                                                          11000
```

```
                    (MEA
                    (* VI-SYS)
]

[RULE #023 "VI IS NOT AS GOAL REQUIRES WITH SIDE"
        (*1: GOL)
        ((NAME OF GOL) = #02)
        (EXP = NO)
        ((TYPE OF (VI-REF)) = LINE) ==>
                    (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
                    (ANV (*1: ATT (ATT OF (CR OF (VI-REF))) (ATT OF (LIX OF (CR OF GOL)))))
                    (STM VI)
                    (PUTPROP GOL RK1 NAME)
                    (* REC-SYS)
]

[RULE #024 "VI IS NOT AS GOAL REQUIRES"
        (*1: GOL)
        ((NAME OF GOL) = #02)
        (EXP = NO)
                    ==>
                    (ANV (*1: ATT (ATT OF (CR OF (VI-REF))) (ATT OF (LIX OF (CR OF GOL)))))
                    (STM VI)
                    (PUTPROP GOL RK1 NAME)
                    (* REC-SYS)
]

[RULE #025 "GOAL COMPLETED WITH LINE PARTIALLY KNOWN"
        (*1: GOL)
        ((NAME OF GOL) = #02) OR ((NAME OF GOL) = #03))
        ((MARK OF (LIX OF (CR OF GOL))) = YES)
        ((TYPE OF (VI-REF)) = LINE)
        ((TYPE OF (LIX OF (CR OF GOL))) = INS)
        (*2: (HAS (ESL OF (LIX OF (CR OF GOL))))) ==>
                    (DEACT)
]

[RULE #026 "GOAL COMPLETED WITH A NEW SIDE"
        (*1: GOL)
        ((NAME OF GOL) = #02)
        ((MARK OF (LIX OF (CR OF GOL))) = YES)
        ((TYPE OF (VI-REF)) = LINE) ==>
                    (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
                    (PUTPROP (CR OF GOL) RAN R1)
                    (PUTPROP (LIX OF (CR OF GOL)) RAN R1)
```

```
11100                   (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
11200                   (PUTPROP GOL 120 NAME)
11300                   (* INC-SYS)
11400   ]
11500
11600   [RULE K027 "GOAL COMPLETED"
11700         (=1: GOL)
11800         ((NAME OF GOL) = K02)
11900         ((MARK OF (LIX OF (CR OF GOL))) = YES) ==>
12000                   (PUTPROP (CR OF GOL) RAN RIX)
12100                   (PUTPROP (LIX OF (CR OF GOL)) RAN RIX)
12200                   (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
12300                   (PUTPROP GOL 120 NAME)
12400                   (* INC-SYS)
12500   ]
12600
12700
12800
12900   [RULE K028 "EXP IS PART OF VERTEX WITH SIDE"
13000         (=1: GOL)
13100         (((NAME OF GOL) = K02) OR ((NAME OF GOL) = K002))
13200         (EXP = CON)
13300         ((TYPE OF (VI-REF)) = LINE) ==>
13400                   (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
13500                   (GMM)
13600                   (ICP =1:)    (IOR)
13700                   (PUTPROP ((PDIR OF GOL) OF (CP OF GOL)) KEA TYPE)
13800                   (PUTPROP (ATT OF (CR OF (VI-REF))) KEA TYPE)
13900                   (PUTPROP ((PDIR OF GOL) OF (CR OF GOL)) (ATT OF (CR OF (VI-REF))) EAL)
14000                   (PUTPROP (ATT OF (CR OF (VI-REF))) ((PDIR OF GOL) OF (CR OF GOL)) EAL)
14100                   (PUTPROP (CR OF (VI-REF)) ABX TYPE)
14200                   (PUTPROP (ATT OF (ATT OF (CR OF (VI-REF)))) ABX TYPE)
14300                   (STM! VI)
14400                   (MEA)
14500                   (* VI-SYS)
14600   ]
14700
14800   [RULE K029 "EXP IS PART OF VERTEX"
14900         (=1: GOL)
15000         (((NAME OF GOL) = K02) OR ((NAME OF GOL) = K002))
15100         (EXP = CON) ==>
15200                   (GMM)
15300                   (ICP =1:)    (IOR)
15400                   (PUTPROP ((PDIR OF GOL) OF (CR OF GOL)) KEA TYPE)
15500                   (PUTPROP (ATT OF (CR OF (VI-REF))) KEA TYPE)
15600                   (PUTPROP ((PDIR OF GOL) OF (CR OF GOL)) (ATT OF (CR OF (VI-REF))) EAL)
15700                   (PUTPROP (ATT OF (CR OF (VI-REF))) ((PDIR OF GOL) OF (CR OF GOL)) EAL)
15800                   (PUTPROP (CR OF (VI-REF)) ABX TYPE)
15900                   (PUTPROP (ATT OF (ATT OF (CR OF (VI-REF)))) ABX TYPE)
16000                   (STM! VI)
16100                   (MEA)
16200                   (* VI-SYS)
16300   ]
16400
16500
```

```
16600
16700  [RULE K0210 "EXPECTED ANGLE IS THERE WITH SIDE"
16800        (=1: GOL)
16900        (((NAME OF GOL) = K02) OR ((NAME OF GOL) = K002))
17000        (EXP = YES)
17100        ((TYPE OF (VI-REF)) = LINE)
17200                              ==>
17300                  (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
17400                  (UMM)
17500                  (ICP =1:)    (IOR)
17600                  (MEA)
17700                  (= VI-SYS)
17800  ]
17900
18000
18100
18200
18300
18400  [RULE K0211 "EXPECTED ANGLE Is THERE"
18500        (=1: GOL)
18600        (((NAME OF GOL) = K02) OR ((NAME OF GOL) = K002))
18700        (EXP = YES)  ==>
18800                  (UMM)
18900                  (ICP =1:)    (IOR)
19000                  (MEA)
19100                  (= VI-SYS)
19200  ]
19300
19400
19500
19600
19700
19800
19900
20000
20100
20200
20300
20400
20500
20600
20700
20800
20900  [RULE K2C1 "EXPECTED ANGLE NOT THERE IN CONFIRMATION"
21000        (=1: GOL)
21100        ((NAME OF GOL) = K2C)
21200        (EXP = NO)   ==>
21300                  (DEACT)
21400  ]
21500
21600
21700
21800
21900  [RULE K2C2 "FINAL SIDE OF OVERLAY CONFIRMED WITH SIDE"
22000        (=1: GOL)
```

```
22100         ((NAME OF GOL) = K2C)
22200         (EXP = CON)
22300         ((TYPE OF (VI-REF)) = LINE)
22400         ((TYPE OF (LIX OF (CR OF GOL))) = ICS)
22500                   ==>
22600                         (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
22700                         (PUTPROP GOL I2D NAME )
22800                         (* INC-SYS)
22900   ]
23000
23100
23200
23300
23400   [RULE K203 "COMPLETE OVERLAY OBJECT CONFIRMATION"
23500         (#1: GOL)
23600         ((NAME OF GOL) = K2C)
23700         (EXP = CON)
23800         ((TYPE OF (LIX OF (CR OF GOL))) = ICC)
23900                   ==>
24000                         (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
24100                         (PUTPROP GOL I2D NAME)
24200                         (* INC-SYS)
24300   ]
24400
24500
24600
24700   [RULE K204 "COMPLETE CONFIRM WITH SIDE AND VERTEX"
24800         (#1: GOL)
24900         ((NAME OF GOL) = K2C)
25000         ((MARK OF (LIX OF (CR OF GOL))) = YES)
25100         (EXP = CON)
25200         ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KEA)
25300         ((TYPE OF (LIX OF (CR OF GOL))) = INS)
25400         ((TYPE OF (VI-REF)) = LINE)
25500                   ==>
25600                   (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
25700                   (PUTPROP GOL I2D NAME)
25800                   (* INC-SYS)
25900   ]
26000
26100   [RULE K205 "COMPLETE CONFIRM WITH VERTEX"
26200         (#1: GOL)
26300         ((NAME OF GOL) = K2C)
26400         ((MARK OF (LIX OF (CR OF GOL))) = YES)
26500         (EXP = CON)
26600         ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KEA)
26700         ((TYPE OF (LIX OF (CR OF GOL))) = INT)
26800         ((TYPE OF (VI-REF)) = VERTEX)
26900                   ==>
27000                   (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
27100                   (PUTPROP GOL I2D NAME)
27200                   (* INC-SYS)
27300   ]
27400
27500
```

```
27600  [RULE K206 "COMPLETE CONFIRMATION WITH SIDE"
27700       (#1: GOL)
27800       ((NAME OF GOL) = K2C)
27900       ((MARK OF (LIX OF (CR OF GOL))) = YES)
28000       (EXP = YES)
28100       ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KIA)
28200       ((TYPE OF (LIX OF (CR OF GOL))) = INS)
28300       ((TYPE OF (VI-REF)) = LINE)
28400                   ==>
28500                   (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
28600                   (PUTPROP GOL I2D NAME)
28700                   (* INC-SYS)
28800  ]
28900
29000
29100  [RULE K207 "COMPLETE CONFIRM"
29200       (#1: GOL)
29300       ((NAME OF GOL) = K2C)
29400       ((MARK OF (LIX OF (CR OF GOL))) = YES)
29500       (EXP = YES)
29600       ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KIA)
29700       ((TYPE OF (LIX OF (CR OF GOL))) = INT)
29800       ((TYPE OF (VI-REF)) = VERTEX)
29900                   ==>
30000                   (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
30100                   (PUTPROP GOL I2D NAME)
30200                   (* INC-SYS)
30300  ]
30400
30500
30600  [RULE K208 "EXPECTED ANGLE WITH SIDE AND VERTEX"
30700       (#1: GOL)
30800       ((NAME OF GOL) = K2C)
30900       (EXP = CON)
31000       ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KEA)
31100       ((TYPE OF (LIX OF (CR OF GOL))) = INS)
31200       ((TYPE OF (VI-REF)) = LINE)
31300                   ==>
31400                        (UMM)
31500                        (MEA)
31600                        (* VI-SYS)
31700  ]
31800
31900
32000
32100  [RULE K209 "EXPECTED ANGLE WITH VERTEX"
32200       (#1: GOL)
32300       ((NAME OF GOL) = K2C)
32400       (EXP = CON)
32500       ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KEA)
32600       ((TYPE OF (LIX OF (CR OF GOL))) = INT)
32700       ((TYPE OF (VI-REF)) = VERTEX)
32800                   ==>
32900                        (UMM)
33000                        (MEA)
```

```
33100                          (* VI-SYS)
33200 ]
33300
33400
33500
33600 [RULE  K2C10 "EXPECTED ANGLE WITH SIDE"
33700       (#1: GOL)
33800       ((NAME OF GOL) = K2C)
33900       (EXP = YES)
34000       ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KIA)
34100       ((TYPE OF (LIX OF (CR OF GOL))) = INS)
34200       ((TYPE OF (VI-REF)) = LINE)
34300                   ==>
34400                          (UMM)
34500                          (MEA)
34600                          (* VI-SYS)
34700 ]
34800
34900
35000 [RULE K2C11 "EXPECTED ANGLE"
35100       (#1: GOL)
35200       ((NAME OF GOL) = K2C)
35300       (EXP = YES)
35400       ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KIA)
35500       ((TYPE OF (LIX OF (CR OF GOL))) = INT)
35600       ((TYPE OF (VI-REF)) = VERTEX)
35700                   ==>
35800                          (UMM)
35900                          (MEA)
36000                          (* VI-SYS)
36100 ]
36200
36300
36400 [RULE K2C12 "EXPECTED ANGLE BUT WRONG SIDE OR VERTEX CONTEXT"
36500       (#1: GOL)
36600       ((NAME OF GOL) = K2C)
36700                   ==>
36800                          (DEACT)
36900 ]
37000
37100
37200
37300
37400
37500
37600
37700
37800
37900
38000
38100
38200
38300 [RULE U021 "COMPLETE OUTLINE SIDE STARTED TWO WAYS"
38400       (#1: GOL)
38500       ((NAME OF GOL) = U02)
```

```
38600         (#2: COM $1 )
38700         ((TYPE OF (CR OF GOL)) = INS)
38800         ((TYPE OF (PR OF GOL)) = INS)
38900         (CAC $1 (PDIR OF GOL))
39000                   ==>
39100                         (NEED #3: $4 (HAS (ESL OF (CR OF GOL))))
39200                         (NEED #5: $5 (HAS (ESL OF (PR OF GOL))))
39300                         (CDS #4: #5: (CR OF $4) (CR OF $5))
39400                         (PUTPROP (CR OF GOL) (RIX OF (PR OF GOL)) OF (RAN OF (RIX OF (CR O
39500                         (PUTPROP (PR OF GOL) (RIX OF (CR OF GOL)) RIX)
39600                         (PUTPROP (PR OF GOL) (CR OF GOL) LIX)
39700                         (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
39800                         (PUTPROP GOL (PR OF GOL) CR)
39900                         (PUTPROP GOL RUC NAME)
40000                         (* REC-SYS)
40100   ]
40200
40300
40400
40500
40600
40700
40800   [RULE U022 "OUTLINE COMPLETED WITH SIDE"
40900         (#1: GOL)
41000         ((NAME OF GOL) = U02)
41100         (#2: COM $1)
41200         ((TYPE OF (CR OF GOL)) = INS)
41300         (CAC $1 (PDIR OF GOL))
41400                   ==>
41500                         (NEED #4: $4: (HAS (ESL OF (CR OF GOL))))
41600                         (PUTPROP (CR OF $4) RAN RIX)
41700                         (MSF #4: (PDIR OF GOL) (PR OF GOL) $4)
41800                         (PUTPROP (CR OF GOL) (FAN OF (RIX OF (CR OF GOL))) RIX)
41900                         (PUTPROP (PR OF GOL) (RIX OF (CR OF GOL)) RIX)
42000                         (PUTPROP (PR OF GOL) INS TYPE)
42100                         (PUTPROP (PR OF GOL) (CR OF GOL) LIX)
42200                         (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
42300                         (PUTPROP GOL (PR OF GOL) CR)
42400                         (PUTPROP GOL RUC NAME)
42500                         (* REC-SYS)
42600
42700   ]
42800
42900
43000
43100
43200
43300   [RULE U023 "OUTLINE COMPLETED WITH OLD SIDE"
43400         (#1: GOL)
43500         ((NAME OF GOL) = U02)
43600         (#2: COM $1)
43700         ((TYPE OF (PR OF GOL)) = INS)
43800         (CAC $1 (PDIR OF GOL))
43900                   ==>
44000                         (NEED #4: $4: (HAS (ESL OF (PR OF GOL))))
```

```
                        (PUTPROP (CR OF $4) RAN RIX)
                        (MSF #4: (PDIR OF GOL) (CR OF GOL) $4)
                        (PUTPROP (CR OF GOL) (RAN OF (RIX OF (PR OF GOL))) RIX)
                        (PUTPROP (PR OF GOL) (RIX OF (CR OF GOL)) RIX)
                        (PUTPROP (CR OF GOL) LIX (TYPE)
                        (PUTPROP (PR OF GOL) (CR OF GOL) LIX)
                        (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
                        (PUTPROP GOL (PR OF GOL) CR)
                        (PUTPROP GOL RUC NAME)
                        (# REC-SYS)
]

[RULE U024 "OUTLINE COMPLETED"
        (#1: GOL)
        ((NAME OF GOL) = U02)
        (#2: COM $1)
        (CAC $1 (PDIR OF GOL))
                ==>
                        (#2: COM +)
                        (PUTPROP (CR OF GOL) RAN RIX)
                        (PUTPROP (PR OF GOL) RAN RIX)
                        (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
                        (PUTPROP (PR OF GOL) (CR OF GOL) LIX)
                        (PUTPROP GOL (PR OF GOL) CR)
                        (PUTPROP GOL RUC NAME)
                        (# REC-SYS)
]

[RULE U025 "ANOTHER STA LETS SIDE CONTINUE"
        (#1: GOL)
        (((NAME OF GOL) = U02) OR ((NAME OF GOL) = U002))
        ((ANG OF ((PDIR OF GOL) OF (CR OF (VI-REF)))) = STA)
        ((TYPE OF (CR OF GOL)) = IMS)
                ==>
                        (NEED #4: $4 (HAS (ESL OF (CR OF GOL))))
                        (PUTPROP (CR OF $4) RAN RIX)
                        (MSC #4: (PDIR OF GOL) (CR OF (VI-REF)) $4 VI)
                        (PUTPROP (CR OF GOL) (RAN OF (RIX OF (CR OF GOL))) RIX)
                        (IOR)
                        (MCR)
                        (# VI-SYS)
]

[RULE U026 "STA SIGNALS SIDE BEGIN"
```

```
49500         (#1: GOL)
49700         (((NAME OF GOL) = U02) OR ((NAME OF GOL) = U002))
49800         ((ANG OF ((PDIR OF GOL) OF (CR OF (VI-REF)))) = STA)
49900                         ==>
50000                               (PUTPROP (CR OF GOL) RAN RIX)
50100                               (MSB (PDIR OF GOL) (CR OF (VI-REF)) VI)
50200                               (IOR)
50300                               (MCR)
50400                               (* VI-SYS
50500   ]
50600
50700
50800
50900
51000
51100   [RULE U027 "SIDE IS COMPLETED NEW CORNER"
51200         (#1: GOL)
51300         (((NAME OF GOL) = U02) OR ((NAME OF GOL) = U002))
51400         ((TYPE OF (CR OF GOL)) = INS)
51500                         ==>
51600                               (NEED #4: $4 (HAS (ESL OF (CR OF GOL))))
51700                               (PUTPROP (CR OF $4) RAN RIX)
51800                               (PUTPROP (CR OF GOL) (RAN OF (RIX OF (CR OF GOL))) RIX)
51900                               (UDM #1: ((PDIR OF GOL) OF (CR OF (VI-REF))))
52000                               (MSF #4: (DIV 1 OF ((PDIR OF GOL) OF ((PDIR OF GOL) OF (CR OF GOL)))
52100                               (PUTPROP ((PDIR OF GOL) OF ((PDIR OF GOL) OF (CR OF GOL))) INS TYP
52200                               (STM! VI)
52300                               (IOR)
52400                               (MCR)
52500                               (* VI-SYS)
52600   ]
52700
52800
52900   [RULE U028 "NEW CORNER"
53000         (#1: GOL)
53100         (((NAME OF GOL) = U02) OR ((NAME OF GOL) = U002))
53200                         ==>
53300                               (PUTPROP (CR OF GOL) RAN RIX)
53400                               (UDM #1: ((PDIR OF GOL) OF (CR OF (VI-REF))))
53500                               (STM! VI)
53600                               (IOR)
53700                               (MCR)
53800                               (* VI-SYS)
53900   ]
54000
54100
54200
54300
54400
54500
```

```
00100  [RULE 0021 "AT POSSIBLE OVERLAY INTERSECTION WITH SIDE"
00200          (#1: GOL $1 )
00300          ((NAME OF GOL) = 002)
00400          (EXP = NO)
00500          ((TYPE OF (VI-REF) ) = LINE)
00600          (NOT ((SPEC OF (VER OF (VI-REF))) = V2))
00700          (#2: COM $2)
00800          (CPL (ATT OF (ATT OF (CR OF (VI-REF)))) (CR OF $2) )
00900                       ==>
01000                       (AMO #1: $1 (CR OF GOL) (CR OF (VI-REF)))
01100                       (MSL (CR OF (VI-REF)) (LIX OF (CR OF GOL)) (CR OF GOL))
01200                       (PUTPROP (CR OF GOL) ICS TYPE)
01300                       (PUTPROP (VI-REF) (ATT OF (ATT OF (CR OF (VI-REF)))) CR)
01400                       (UPDP (VI-REF))
01500                       (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
01600                       #4: + (NEW-STM)) (ALTER #4: < LAST)
01700                       (MEX $2)
01800                       (DIR = (OPPO OF (DVX OF (CR OF $2))))
01900                       (PUTPROP GOL TOL NAME)
02000                       (* VI-SYS)
02100  ]
02200
02300  [RULE 0022 "AT POSSIBLE OVERLAY INTERSECTION"
02400          (#1: GOL $1 )
02500          ((NAME OF GOL) = 002)
02600          (EXP = NO)
02700          (NOT ((SPEC OF (VI-REF)) = V2))
02800          (#2: COM $2)
02900          (CPL (ATT OF (ATT OF (CR OF (VI-REF)))) (CR OF $2))
03000                       ==>
03100                       (AMO #1: $1 (CR OF GOL) (CR OF (VI-REF)))
03200                       (PUTPROP (VI-REF) (ATT OF (ATT OF  (CR OF (VI-REF)))) CR)
03300                       (UPDP (VI-REF))
03400                       (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
03500                       ( #4 + (NEW-STM)) (ALTER #4: < LAST)
03600                       (MEX $2)
03700                       (DIR = (OPPO OF (DVX OF (CR OF $2))))
03800                       (PUTPROP GOL TOL NAME)
03900                       (* VI-SYS)
04000  ]
04100
04200  [RULE 0023 "VI IS NOT AS GOAL REQUIRES WITH SIDE"
04300          (#1: GOL)
04400          ((NAME OF GOL) = 002)
04500          (EXP = NO)
04600          ((TYPE OF (VI-REF)) = LINE) ==>
04700                       (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
04800                       (AMV #1: ATT (ATT OF (CR OF (VI-REF))) (ATT OF (LIX OF (CR OF GOL))))
04900                       (STM' VI)
05000                       (PUTPROP GOL ROI NAME)
05100                       (* REC-SYS)
05200  ]
05300
05400
05500
05600
05700
05800
05900  [RULE 00
06000          (#
06100          ((N
06200          (E
06300
06400
06500
06600
06700
06800  ]
06900
07000
07100
07200  [RULE 00
07300          #1
07400          (N
07500          (EX
07600          ((T
07700          ((T
07800          ((T
07900
08000
08100
08200
08300  ]
08400
08500
08600
08700  [RULE 002
08800          #1:
08900          ((NA
09000          (EXP
09100          ((TYP
09200          ((TYP
09300          ((TYP
09400
09500
09600
09700
09800  ]
09900
10000
10100  [RULE 0027
10200          (#1 G
10300          ((NAM
10400          (((( TY
10500          OR
10600
10700
10800
10900  ]
11000
```

```
05600
05700
05800
05900  [RULE 0024 "VI IS NOT AS GOAL REQUIRES"
06000        (#1: GOL)
06100        ((NAME OF GOL) = 002)
06200        (EXP = NO)
06300                    ==>
06400                    (ANY #1: ATT (ATT OF (CR OF (VI-REF))) (ATT OF (LIX OF (CR OF GOL))))
06500                    (STM VI)
06600                    (PUTPROP GOL ROI NAME)
06700                    (* REC-SYS)
06800  ]
06900
07000
07100
07200  [RULE 0025 "REVIEW PART OF OVERLAY OBJECT WITH SIDE AND VERTEX"
07300        (#1: GOL)
07400        ((NAME OF GOL) = 002)
07500        (EXP = CON)
07600        ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KEA)
07700        ((TYPE OF (VI-REF)) = LINE)
07800        ((TYPE OF (LIX OF (CR OF GOL))) = INS)
07900                    ==>
08000                         (UMM)
08100                         (MEA)
08200                         (* VI-SYS)
08300  ]
08400
08500
08600
08700  [RULE 0026 "EXPECTED ANGLE WITH VERTEX"
08800        (#1: GOL)
08900        ((NAME OF GOL) = 002)
09000        (EXP = CON)
09100        ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KEA)
09200        ((TYPE OF (LIX OF (CR OF GOL))) = INT)
09300        ((TYPE OF (VI-REF)) = VERTEX)
09400                    ==>
09500                         (UMM)
09600                         (MEA)
09700                         (* VI-SYS)
09800  ]
09900
10000
10100  [RULE 0027 "NOT EXPECTED SIDE OR VERTEX CONTEXT"
10200        (#1: GOL)
10300        ((NAME OF GOL) = 002)
10400        ((( TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KEA) AND (EXP = YES))
10500        OR     (((TYPE OF (LIX OF (CR OF GOL))) = INS) AND
10600                    ((TYPE OF (VI-REF)) = VERTEX)))
10700                    ==>
10800                         (DEACT)
10900  ]
11000
```

```
11100
11200  [RULE 0028 "EXP IS PART OF VERTEX WITH SIDE"
11300        (=1: GOL)
11400        ((NAME OF GOL) = 002)
11500        (EXP = CON)
11600        ((TYPE OF (V1-REF)) = LINE) ==>
11700                    (MSL (CR OF (V1-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
11800                    (UMM)
11900                    (ICP =1:)
12000                    (PUTPROP ((PDIR OF GOL) OF (CR OF GOL)) KEA TYPE)
12100                    (PUTPROP (ATT OF (CR OF (V1-REF))) KEA TYPE)
12200                    (PUTPROP ((PDIR OF GOL) OF (CR OF GOL)) (ATT OF (CR OF (V1-REF))) EAL)
12300                    (PUTPROP (ATT OF (CR OF (V1-REF))) ((PDIR OF GOL) OF (CR OF GOL)) EAL)
12400                    (PUTPROP (CR OF (V1-REF)) ABX TYPE)
12500                    (PUTPROP (ATT OF (ATT OF (CR OF (V1-REF)))) ABX TYPE)
12600                    (STM! V1)
12700                    (MEA)
12800                    (* V1-SYS)
12900  ]
13000
13100  [RULE 0029 "EXP IS PART OF VERTEX"
13200        (=1: GOL)
13300        ((NAME OF GOL) = 002)
13400        (EXP = CON) ==>
13500                    (UMM)
13600                    (ICP =1:)
13700                    (PUTPROP ((PDIR OF GOL) OF (CR OF GOL)) KEA TYPE)
13800                    (PUTPROP (ATT OF (CR OF (V1-REF))) KEA TYPE)
13900                    (PUTPROP ((PDIR OF GOL) OF (CR OF GOL)) (ATT OF (CR OF (V1-REF))) EAL)
14000                    (PUTPROP (ATT OF (CR OF (V1-REF))) ((PDIR OF GOL) OF (CR OF GOL)) EAL)
14100                    (PUTPROP (CR OF (V1-REF)) ABX TYPE)
14200                    (PUTPROP (ATT OF (ATT OF (CR OF (V1-REF)))) ABX TYPE)
14300                    (STM! V1)
14400                    (MEA)
14500                    (* V1-SYS)
14600  ]
14700
14800
14900
15000
15100  [RULE  00210 "EXPECTED ANGLE WITH SIDE"
15200        (=1: GOL)
15300        ((NAME OF GOL) = 002)
15400        (EXP = YES)
15500        ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KIA)
15600        ((TYPE OF (LIX OF (CR OF GOL))) = INS)
15700        ((TYPE OF (V1-REF)) = LINE)
15800                  ==>
15900                        (UMM)
16000                        (MEA)
16100                        (* V1-SYS)
16200  ]
16300
16400
16500  [RULE 00211 "EXPECTED ANGLE"
```

```
16600        (=1: GOL)
16700        ((NAME OF GOL) = 002)
16800        (EXP = YES)
16900        ((TYPE OF (ATT OF (LIX OF
17000        ((TYPE OF (LIX OF (CR OF
17100        ((TYPE OF (V1-REF)) = VER
17200                  ==>
17300                        (UMM)
17400                        (MEA)
17500                        (* V1-S
17600  ]
17700
17800
17900
18000  [RULE 00212 "EXPECTED ANGL
18100        (=1: GOL)
18200        ((NAME OF GOL) = 002)
18300        (EXP = YES)
18400        ((TYPE OF (V1-REF)) = LI
18500                              ==>
18600                    (MSL (CR OF
18700                    (UMM)
18800                    (ICP =1:)
18900                    (MEA)
19000                    (* V1-SYS)
19100  ]
19200
19300
19400
19500
19600
19700  [RULE 00213 "EXPECTED ANG
19800        (=1: GOL)
19900        ((NAME OF GOL) = 002)
20000        (EXP = YES)  ==>
20100                    (UMM)
20200                    (ICP =1:)
20300                    (MEA)
20400                    (* V1-SYS)
20500  ]
20600
20700
20800
20900
21000
21100
21200
21300
21400  [RULE RAAO "SEE FIRST VISU
21500        (EXP = FI)
21600                  ==>
21700                        (ST
21800                        (=4
21900                        (=4
22000                        (NE
```

```
        (=1: GOL)
        ((NAME OF GOL) = 002)
        (EXP = YES)
        ((TYPE OF (ATT OF (LIX OF (CR OF GOL)))) = KIA)
        ((TYPE OF (LIX OF (CR OF GOL))) = INT)
        ((TYPE OF (VI-REF)) = VERTEX)
                    ==>
                        (UMM)
                        (MEA)
                        (= VI-SYS)
]

[RULE 00212 "EXPECTED ANGLE IS THERE WITH SIDE"
        (=1: GOL)
        ((NAME OF GOL) = 002)
        (EXP = YES)
        ((TYPE OF (VI-REF)) = LINE)
                        ==>
                    (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
                    (UMM)
                    (ICP =1:)
                    (MEA)
                    (= VI-SYS)
]

[RULE 00213 "EXPECTED ANGLE IS THERE"
        (=1: GOL)
        ((NAME OF GOL) = 002)
        (EXP = YES)  ==>
                    (UMM)
                    (ICP =1:)
                    (MEA)
                    (= VI-SYS)
]

[RULE RAA0 "SEE FIRST VISUAL INFO"
        (EXP = FI)
                    ==>
                        (STM! VI)
                        (=4: ← (CAR STM))
                        (=4: < LAST)
                        (NEW =3: GOL)
```

```
                    (PUTPROP GOL ATT PO(P)
                    (PUTPROP GOL RNO NAME)
                    (VRNULL)
                    (* REC-SYS)
]


[RULE RAA00 "THIS IS THE START RULE"
      (EXP = F)
      (NULL VI)
                ==>
                    (* VI SYS)
]


[RULE TOL1 "OVERLAY LINE CONFIRMED AND STORED"
      (*1: GOL)
      ((NAME OF GOL) = TOL)
      (EXP = YES)
      (*2: COM $1)
      (*3: LAST $2)          ==>
                (ALTER *2: COM ←)
                (ALTER *3: LAST ←)
                (MLO *3: $2 *2: $1)
                (ALTER *2: < LAST)
                (MFL $1)
                (* VI-SYS)
]


[RULE TOL2 "OVERLAY LINE NOT AS EXPECTED"
      (*1: GOL)
      ((NAME OF GOL) = TOL)
      (EXP = NO)
                ==>
                    (DEACT)
]


[RULE TOL3 "REACH A CORNER TO COMPLETE OVERLAY LINE"
      (*1: GOL)
      ((NAME OF GOL ) = TOL)
      (NULL EXP)
      (LESS-THAN-STA (ANG OF ((PDIR OF GOL) OF (CR OF (VI-REF)))))
      (*3: LAST $1)
                ==>
                    (ALTER *3: LAST ←)
                    (FLO $1)
```

```
                    (UPDP (VI-REF))
                    (#2: ← (NEW-STM))
                    (ALTER #2: < LAST)
                    (MFO (CR OF (VI-REF)))
                    (PUTPROP GOL  TOX1 NAME)
                    (# VI-SYS)
]


[RULE TOL4 "CORNER LEAVES OVERLAY DOUBT"
      (#1: GOL)
      ((NAME OF GOL) = TOL)
      (NULL EXP)
                    ==>
                (DEACT)
]


[RULE TOX11 "A SIMPLE VERTEX GIVES OVERLAY OBJECT GOL WITH SIDE"
      (#1: GOL)
      ((NAME OF GOL) =  TOX1)
      (NULL EXP)
      ((TYPE OF (VI-REF)) = LINE)
      ((SPEC OF (VER OF (VI-REF))) = V2)
      (LESS-THAN-STA (ANG OF (ATT OF (CR OF (VI-REF)))))
      (#2: LAST $1)
                ==>
                (ENL (CR OF $1))
                (UPDP (VI-REF))
                (#3: ← (NEW-STM))
                (ALTER #2: LAST ← )
                (ALTER #3: < LAST)
                (ALTER #1: GOL ← OGOL)
                (PUTPROP OGOL (PR OF GOL) PR)
                (PUTPROP OGOL (CR OF GOL) CR)
                (REMPROP GOL LINK)
                (NEW #4: GOL)
                (PUTPROP GOL ROO NAME)
                (# REC-SYS)
]


[RULE TOX12 "SIMPLE VERTEX LEADS TO OVERLAY OBJECT GOAL"
      (#1: GOL)
      ((NAME OF GOL) = TOX1)
```

```
33100         (NULL EXP)
33200         ((TYPE OF (VI-REF)) = VERTEX)
33300         ((SPEC OF (VI-REF)) = V2)
33400         (LESS-THAN-STA (ANG OF (ATT OF (CR OF (VI-REF)))))
33500         (#2: LAST $1)
33600                     ==>
33700                           (ENV (CR OF $1))
33800                     (UPDP (VI-REF))
33900                     (#3: ← (NEW-STM))
34000                     (ALTER #2: LAST ← )
34100                     (ALTER #3: < LAST)
34200                     (ALTER #1: GOL ← OGOL)
34300                     (PUTPROP OGOL (PR OF GOL) PR)
34400                     (PUTPROP OGOL (CR OF GOL) CR)
34500                     (REMPROP GOL LINK)
34600                     (NEW #4: GOL)
34700                     (PUTPROP GOL ROO NAME)
34800                     (* REC-SYS)
34900   ]
35000
35100
35200
35300   [RULE TOX13 "EXTENT OF MOVE ALLOWS OVERLAY"
35400         (#1: GOL)
35500         ((NAME OF GOL) = TOX1)
35600         (NULL EXP)
35700         (LESS-THAN-STA (ANG OF (ATT OF (CR OF (VI-REF)))))
35800         (NOT (RAN = SH))
35900         (#2: LAST $1)
36000                     ==>
36100                           (MAEX (CR OF $1))
36200                           (DIR ← (OPPO OF (DVX OF (CR OF $1))))
36300                           (* VI-SYS)
36400   ]
36500
36600
36700
36800
36900   [RULE TOX14 "ANGLE LARGER THAN STA PUTS OVERLAY IN DOUBT"
37000         (#1: GOL)
37100         ((NAME OF GOL) = TOX1)
37200         (NULL EXP)
37300                     ==>
37400                     (DEACT)
37500   ]
37600
37700
37800
37900   [RULE TOX15 "MOVE BACK TO OVERLAY LINE"
38000         (#1: GOL)
38100         ((NAME OF GOL) = TOX1)
38200         ((EXP = YES) OR (EXP = CON))
38300         (#2: LAST $1)
38400                     ==>
38500                     (UPDP $1)
```

```
38600                     (PUTPRO
38700                     (NEED
38800                     (ALTER
38900                     (ALTER
39000                     (PUTPRO
39100                     (MOL $2
39200                     (* VI-SY
39300   ]
39400
39500
39600   [RULE TOLA1 "LINE IS TRA
39700         (#1: GOL)
39800         ((NAME OF GOL) = T
39900         (NULL EXP)
40000         (LESS-THAN-STA (AN
40100         (#2: LAST $1)
40200                     ==>
40300                     (EVLL (C
40400                     (UIR $1)
40500                     (UPDP (V
40600                     (#3: ← (
40700                     (MFO (CR
40800                     (PUTPRO
40900                     (ALTER
41000                     (ALTER
41100                     (* VI-SY
41200   ]
41300
41400
41500
41600
41700   [RULE TOLA2 "LINE IS TRAV
41800         (#1: GOL)
41900         ((NAME OF GOL) = TO
42000         ((EXP = YES) OR (EXP
42100         (#2: LAST $1)
42200         (#3: COM $2)
42300         (LESS-THAN-STA (ANG
42400                     ==>
42500                     (UIR $1)
42600                           (UP
42700                           (PU
42800                           (AL
42900                           (AL
43000                           (MF
43100                           (* V
43200   ]
43300
43400
43500
43600
43700
43800   [RULE TOLA3 "ANGLE WRONG
43900         (#1: GOL)
44000         ((NAME OF GOL) = TOL
```

```
38600                   (PUTPROP GOL TOLA NAME)
38700                   (NEED *3 $2 (HAS (XLX OF (CR OF $1))))
38800                   (ALTER *2: LAST ← )
38900                   (ALTER *3: < LAST)
39000                   (PUTPROP $2 (XLX OF (CR OF $1)) CR)
39100                   (MOL $2)
39200                   (* VI-SYS)
39300 ]
39400
39500
39600 [RULE TOLA1 "LINE IS TRAVERSED NOT KNOWING OTHER END"
39700       (*1: GOL)
39800       ((NAME OF GOL) = TOLA)
39900       (NULL EXP)
40000       (LESS-THAN-STA (ANG OF (ATT OF (CR OF (VI-REF)))))
40100       (*2: LAST $1)
40200                   ==>
40300                   (EVLL (CR OF $1))
40400                   (UIR $1)
40500                   (UPDP (VI-REF))
40600                   (*3: ← (NEW-STM))
40700                   (MFO (CR OF (VI-REF)))
40800                   (PUTPROP GOL TOX2 NAME)
40900                   (ALTER *2: LAST ←)
41000                   (ALTER *3: < LAST)
41100                   (* VI-SYS)
41200 ]
41300
41400
41500
41600
41700 [RULE TOLA2 "LINE IS TRAVERSED  END KNOWN"
41800       (*1: GOL)
41900       ((NAME OF GOL) = TOLA)
42000       ((EXP = YES) OR (EXP = CON))
42100       (*2: LAST $1)
42200       (*3: COM $2)
42300       (LESS-THAN-STA (ANG OF (ATT OF (CR OF (VI-REF)))))
42400                   ==>
42500                   (UIR $1)
42600                         (UPDP $2)
42700                         (PUTPROP GOL TOX2 NAME)
42800                         (ALTER *2: LAST ← )
42900                         (ALTER *3: COM ← LAST)
43000                         (MFO (CR OF $2))
43100                         (* VI-SYS)
43200 ]
43300
43400
43500
43600
43700
43800 [RULE TOLA3 "ANGLE WRONG OR GREATER THAN STA LEAVES OVERLAY DOUBT"
43900       (*1: GOL)
44000       ((NAME OF GOL) = TOLA)
```

```
                ==>
                        (DEACT)
]


[RULE TOX21 "SIMPLE VERTEX INCORPORATION OF O OBJECT"
        (#1: GOL)
        ((NAME OF GOL) = TOX2)
        (NULL EXP)
        (#2: LAST $1)
        ((TYPE OF (V1-REF)) = LINE)
        ((SPEC OF (VER OF (V1-REF))) = V2)
        (LESS-THAN-STA (ANG OF (ATT OF (CR OF (V1-REF)))))
                ==>
                        (ENL (CR OF $1))
                        (ALTER #2: LAST +)
                        (UPDP (V1-REF))
                        (#3: + (NEW-STM))
                        (ALTER #3: < LAST)
                        (PUTPROP GOL NAME 101)
                        (# INC-SYS)
]


[RULE TOX22 "SIMPLE VERTEX INCORPORATE OBJECT"
        (#1: GOL)
        ((NAME OF GOL) = TOX2)
        (NULL EXP)
        ((TYPE OF (V1-REF)) = VERTEX)
        ((SPEC OF (V1-REF)) = V2)
        (LESS-THAN-STA (ANG OF (ATT OF (CR OF (V1-REF)))))
        (#2: LAST $1)
                ==>
                        (ENV (CR OF $1))
                        (ALTER #2: LAST +)
                        (UPDP (V1-REF))
                        (#3: + (NEW-STM))
                        (ALTER #3: < LAST)
                        (PUTPROP GOL NAME 101)
                        (# INC-SYS)
]


[RULE TOX23 "EXTENT OF MOVE ALLOWS OVERLAY INCORPORATION"
        (#1: GOL)
        ((NAME OF GOL ) = TOX2)
        (NULL EXP)
        (NOT (RAN = SH))
        (LESS-THAN-STA (ANG OF (ATT OF (CR OF ((V1-REF)))))
        (#2: LAST $1)
                ==>
```

```
]


[RULE TOX24 "E
        (#1: GOL)
        ((NAME OF
        (NULL EXP
]


[RULE TOX25 "M
        (#1: GOL)
        ((NAME OF
        ((EXP = YE
        (#2: LAST
]


[RULE TOL1 "TR
        (#1: GOL)
        ((NAME OF
        ((EXP = YE
        (#2: LAST
        (#3: COM
]
```

```
49600                       (PUTPROP GOL 100 NAME)
49700                       (MAEX (CR OF $1))
49800                       (DIR ← (OPPO OF (DVx OF (CR OF $1))))
49900                       (* VI-SYS)
50000                       (* INC-SYS)
50100  ]
50200
50300
50400
50500
50600  [RULE TOX24 "EXTENT OR ANGLE PUTS OVERLAY IN DOUBT"
50700       (=1: GOL)
50800       ((NAME OF GOL) = TOX2)
50900       (NULL EXP)
51000                  ==>
51100                       (DEACT)
51200  ]
51300
51400
51500
51600  [RULE TOX25 "MOVES BACK TO OVERLAY LINE"
51700       (=1: GOL)
51800       ((NAME OF GOL) = TOX2)
51900       ((EXP = YES) OR (EXP = CON))
52000       (=2: LAST $1)
52100                  ==>
52200                       (UPDP $1)
52300                       (NEED =3: $2 (HAS (XLX OF (CR OF $1))))
52400                       (PUTPROP $2 (XLX OF (CR OF $1)) CR)
52500                       (MOL $2)
52600                       (PUTPROP GOL TOLL NAME)
52700                       (* VI-SYS)
52800  ]
52900
53000
53100
53200  [RULE TOLL1 "TRAVERSES OVERLAY LINE AND BEGINS NEW RECOGNITION"
53300       (=1: GOL)
53400       ((NAME OF GOL) = TOLL)
53500       ((EXP = YES) OF (EXP = CON))
53600       (=2: LAST)
53700       (=3: COM $1)
53800                  ==>
53900                       (ALTER =2: LAST ←)
54000                       (ALTER =3: COM ← LAST)
54100                       (UPDP $1)
54200                       (PUTPROP GOL RNO NAME)
54300                       (REMPROP GOL LINK)
54400                       (* REC-SYS)
54500  ]
54600
54700
54800
54900
```

```
00100
00200
00300
00400
00500  [RULE K0023 "VI IS NOT AS OVERLAYING OBJECT GOAL REQUIRES WITH SIDE"
00600        (#1: GOL)
00700        ((NAME OF GOL) = K002)
00800        (EXP = NO)
00900        ((TYPE OF (VI-REF)) = LINE) ==>
01000                  (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF (CR OF GOL)))
01100                  (AMV #1: ATT (ATT OF (CR OF (VI-REF))) (ATT OF (LIX OF (CR OF GOL))))
01200                  (STM! VI)
01300                  (PUTPROP GOL ROKI NAME)
01400                  (* REC-SYS)
01500  ]
01600
01700
01800
01900
02000
02100
02200  [RULE K0024 "VI IS NOT AS OVERLAYING OBJECT GOAL REQI"
02300        (#1: GOL)
02400        ((NAME OF GOL) = K002)
02500        (EXP = NO)
02600                  ==>
02700                  (AMV #1: ATT (ATT OF (CR OF (VI-REF))) (ATT OF (LIX OF (CR OF GOL))))
02800                  (STM! VI)
02900                  (PUTPROP GOL ROKI NAME)
03000                  (* REC-SYS)
03100  ]
03200
03300
03400  [RULE K0026 "OVERLAYING OBJECT GOAL COMPLETED WITH A NEW SIDE"
03500        (#1: GOL)
03600        ((NAME OF GOL) = K002)
03700        ((MARK OF (LIX OF (CR OF GOL))) = YES)
03800        ((TYPE OF (VI-REF)) = LINE) ==>
03900                  (MSL (CR OF (VI-REF)) (CR OF GOL) (LIX OF  (CR OF GOL)))
04000                  (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
04100                  (PUTPROP GOL IOK NAME)
04200                  (* INC-SYS)
04300  ]
04400
04500  [RULE K0027 "OVERLAYING OBJECT GOAL COMPLETED"
04600        (#1: GOL)
04700        ((NAME OF GOL) = K02)
04800        ((MARK OF (LIX OF (CR OF GOL )) = YES) ==>
04900                  (PUTPROP GOL (LIX OF (CR OF GOL)) CR)
05000                  (PUTPROP GOL I2D NAME)
05100                  (PUTPROP GOL IOK NAME)
05200                  (* INC-SYS)
05300  ]
05400
05500
```

```
05600
05700
05800
05900
06000
06100
06200
06300  [RULE U0021 "COMPLETE OVERLAYING OBJECT OUTLIN
06400        (#1: GOL)
06500        ((NAME OF GOL) = U002)
06600        (#2: COM $1 )
06700        (CAC $1 (PDIR OF GOL))
06800        ((TYPE OF (CR OF GOL)) = INS)
06900        ((TYPE OF (PR OF GOL)) = INS)
07000                  ==>
07100                        (NEED #4: $4 (HAS (ESL OF (C
07200                        (NEED #5: $5 (HAS (ESL OF (P
07300                        (COS #4: #5: (CR OF $4) (CR O
07400                        (PUTPROP (CR OF GOL) ((RIX O
07500                        (PUTPROP (PR OF GOL) (RIX O
07600                        (PUTPROP (PR OF GOL) (CR OF
07700                        (PUTPROP (CR OF GOL) (PR OF
07800                        (PUTPROP GOL (PR OF GOL) C
07900                        (PUTPROP GOL IOU NAME)
08000                        (* INC-SYS)
08100  ]
08200
08300
08400
08500
08600
08700
08800  [RULE U0022 "OVERLAYING OBJECT OUTLINE COMPLET
08900        (#1: GOL)
09000        ((NAME OF GOL) = U002)
09100        (#2: COM $1)
09200        (CAC $1 (PDIR OF GOL))
09300        ((TYPE OF (CR OF GOL)) = INS)
09400                  ==>
09500                        (NEED #4: $4: (HAS (ESL OF (
09600                        (PUTPROP (CR OF $4) RAN RIX
09700                        (MSF #4: (PDIR OF GOL) (PR O
09800                        (PUTPROP (CR OF GOL) (RAN O
09900                        (PUTPROP (PR OF GOL) (RIX O
10000                        (PUTPROP (PR OF GOL) INS TY
10100                        (PUTPROP (PR OF GOL) (CR OF
10200                        (PUTPROP (CR OF GOL) (PR OF
10300                        (PUTPROP GOL (PR OF GOL) C
10400                        (PUTPROP GOL IOU NAME)
10500                        (* INC-SYS)
10600
10700  ]
10800
10900
11000
```

```
05600
05700
05800
05900
06000
06100
06200
06300  [RULE U0021 "COMPLETE OVERLAYING OBJECT OUTLINE SIDE STARTED TWO WAYS"
06400        (#1: GOL)
06500        ((NAME OF GOL) = U002)
06600        (#2: COM $1 )
06700        (CAC $1 (PDIR OF GOL))
06800        ((TYPE OF (CR OF GOL)) = INS)
06900        ((TYPE OF (PR OF GOL)) = INS)
07000                    ==>
07100                         (NEED #4: $4 (HAS (ESL OF (CR OF GOL))))
07200                         (NEED #5: $5 (HAS (ESL OF (PR OF GOL))))
07300                         (CDS #4: #5: (CR OF $4) (CR OF $5))
07400                         (PUTPROP (CR OF GOL) ((RIX OF (PR OF GOL)) OF (RAN OF (RIX OF (CR OF
07500                         (PUTPROP (PR OF GOL) (RIX OF (CR OF GOL)) RIX)
07600                         (PUTPROP (PR OF GOL) (CR OF GOL) LIX)
07700                         (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
07800                         (PUTPROP GOL (PR OF GOL) CR)
07900                         (PUTPROP GOL IOU NAME)
08000                         (* INC-SYS)
08100  ]
08200
08300
08400
08500
08600
08700
08800  [RULE U0022 "OVERLAYING OBJECT OUTLINE COMPLETED WITH SIDE"
08900        (#1: GOL)
09000        ((NAME OF GOL) = U002)
09100        (#2: COM $1)
09200        (CAC $1 (PDIR OF GOL))
09300        ((TYPE OF (CR OF GOL)) = INS)
09400                    ==>
09500                         (NEED #4: $4: (HAS (ESL OF (CR OF GOL))))
09600                         (PUTPROP (CR OF $4) RAN RIX)
09700                         (MSF #7: (PDIR OF GOL) (PR OF GOL) $4)
09800                         (PUTPROP (CR OF GOL) (RAN OF (RIX OF (CR OF GOL))) RIX)
09900                         (PUTPROP (PR OF GOL) (RIX OF (CR OF GOL)) RIX)
10000                         (PUTPROP (PR OF GOL) INS TYPE)
10100                         (PUTPROP (PR OF GOL) (CR OF GOL) LIX)
10200                         (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
10300                         (PUTPROP GOL (PR OF GOL) CR)
10400                         (PUTPROP GOL IOU NAME)
10500                         (* INC-SYS)
10600
10700  ]
10800
10900
11000
```

```
11100
11200
11300  [RULE U0023 "OVERLAYING OBJECT OUTLINE COMPLETEO WITH OLO SIDE"
11400        (=1: GOL)
11500        ((NAME OF GOL) = U002)
11600        (=2: COM $1)
11700        (CAC $1 (PDIR OF GOL))
11800        ((TYPE OF (PR OF GOL)) = INS)
11900                    ==>
12000                         (NEED =4: $4: (HAS (ESL OF (PR OF GOL))))
12100                         (PUTPROP (CR OF $4) RAN RIX)
12200                         (MSF =4: (PDIR OF GOL) (CR OF GOL) $4)
12300                         (PUTPROP (CR OF GOL) (RAN OF (RIX OF (PR OF GOL))) RIX)
12400                         (PUTPROP (PR OF GOL) (RIX OF (CR OF GOL)) RIX)
12500                         (PUTPROP (CR OF GOL) INS TYPE)
12600                         (PUTPROP (PR OF GOL) (CR OF GOL) LIX)
12700                         (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
12800                         (PUTPROP GOL (PR OF GOL) CR)
12900                         (PUTPROP GOL IOU NAME)
13000                         (* INC-SYS)
13100
13200  ]
13300
13400
13500
13600
13700
13800  [RULE U0024 "OVERLAYING OBJECT OUTLINE COMPLETED"
13900        (=1: GOL)
14000        ((NAME OF GOL) = U002)
14100        (=2: COM $1)
14200        (CAC $1 (PDIR OF GOL))
14300                    ==>
14400                         (PUTPROP (CR OF GOL) RAN RIX)
14500                         (PUTPROP (PR OF GOL) RAN RIX)
14600                         (PUTPROP (CR OF GOL) (PR OF GOL) LIX)
14700                         (PUTPROP (PR OF GOL) (CR OF GOL)  LIX)
14800                         (PUTPROP  GOL (PR OF GOL) CR)
14900                         (PUTPROP GOL IOU NAME)
15000                         (* INC-SYS)
15100  ]
15200
15300  [RULE SN0000 "NO MORE OBJECTS IN PICTURE"
15400        (=1: GOL)
15500        ((NAME OF GOL) = SNO)
15600        ((LINK OF GOL) = NOMO)
15700                    ==>
15800                         (PUTPROP GOL NOMO NAME)
15900                         (* INC-SYS)
16000  ]
16100
16200  [RULE  SN000 "TROUBLE WITH NEW OBJECT STEAT LOCATION"
16300        (=1: GOL)
16400        ((NAME OF GOL) = SNO)
16500        (=2: LAST $1)
```

```
16600       ((NULL (PDIR OF GOL)) OR ((TYPE OF (CR OF $1)) = UQX))
16700                   ==>
16800                         (DEACT)
16900 ]
17000
17100
17200 [RULE SN00 "START NEW OBJECT AT  UNLINKED POSITION"
17300       (=1: GOL)
17400       ((NAME OF GOL) = SN0)
17500       (=2: LAST $1)
17600                   ==>
17700                         (SN00 $1)
17800                         (UCPPP $1)
17900                         (PUTPROP GOL PNO NAME)
18000                         (REMPROP GOL LINK)
18100                         (* REC-SYS)
18200 ]
18300
18400
18500
18600 [RULE 00C1 "VERTEX AS EXPECTED ON OVERLAYING LINE"
18700       (=1: GOL)
18800       ((NAME OF GOL) = 00C)
18900       (EXP = YES)
19000                   ==>
19100                         (PUTPROP GOL K2C NAME)
19200                         (PUTPROP GOL (DIV1 OF (CR OF GOL)) PDIR)
19300                         (MEA)
19400                         (* VI-SYS)
19500 ]
19600
19700 [RULE SK2C1 "START CONFIRMING OBJECT"
19800       (=1: GOL)
19900       ((NAME OF GOL) = SK2C)
20000                   ==>
20100                         (PUTPROP GOL K2C NAME)
20200                         (MEA)
20300                         (* VI-SYS)
20400 ]
20500
20600 [RULE SU020 "START LOOKING FOR UNKNOWN OBJECT INFO"
20700       (=1: GOL)
20800       ((NAME OF GOL) = SU02)
20900       (NOT (NULL (EAL OF ((PDIR OF GOL) OF (CR OF GOL)))))
21000       (=2: $2 (HAS (EAL OF ((PDIR OF GOL) OF (CR OF GOL)))))
21100                   ==>
21200                         (PUTPROP GOL  U02 NAME)
21300                         (MCR)
21400                         (* VI-SYS)
21500 ]
21600
21700 [RULE SU021 "START LOOKING FOR UNKNOWN OBJECT INFO"
21800       (=1: GOL)
21900       ((NAME OF GOL) = SU02)
22000                   ==>
```

```
22100                       (PUTPROP GOL UO2 NAME)
22200                       (MCR)
22300                       (* VI-SYS)
22400  ]
22500
22600
22700  [RULE SKO21 "START LOOKING FOR KNOWN OBJECT INFO"
22800       (*1: GOL)
22900       ((NAME OF GOL) = SKO2)
23000                  ==>
23100                       (PUTPROP GOL KO2 NAME)
23200                       (MEA)
23300                       (* VI-SYS)
23400  ]
23500
23600
23700  [RULE SUOO21 "START LOOKING FOR UNKNOWN OVERLAY OBJECT INFO"
23800       (*1: GOL)
23900       ((NAME OF GOL) = SUO2)
24000                  ==>
24100                       (PUTPROP GOL UO2 NAME)
24200                       (MCR)
24300                       (* VI-SYS)
24400  ]
24500
24600
24700  [RULE SKOO21 "START LOOKING FOR KNOWN OVERLAY OBJECT INFO"
24800       (*1: GOL)
24900       ((NAME OF GOL) = SKOO2)
25000                  ==>
25100                       (PUTPROP GOL KOO2 NAME)
25200                       (MEA)
25300                       (* VI-SYS)
25400  ]
25500
25600
25700  [RULE SOOO1 "START OVERLAIN OBJECT CONFIRMATION"
25800       (*1: GOL)
25900       ((NAME OF GOL) = SOOO)
26000                  ==>
26100                       (PUTPROP GOL OOO NAME)
26200                       (MEX (VER OF GOL))
26300                       (DIR ← (DIX OF GOL))
26400                       (REMPROP GOL DIX)
26500                       (REMPROP GOL VER)
26600                       (* VI-SYS)
26700  ]
26800
26900
27000
27100  [RULE AAREC1 "RECOGNIZE OVERLAYING OBJECT"
27200       (*1: GOL)
27300       (((NAME OF GOL) = RNO) OR ((NAME OF GOL) = RUO))
27400                  ==>
27500                       (* REC-SYS)
27600  ]
27700
27800
27900
28000
28100
28200
28300  [RULE M
28400
28500
28600
28700
28800
28900
29000
29100
29200  ]
29300
29400  (RETURN
29500  ]
```

```
27600  ]
27700
27800
27900
28000
28100
28200
28300  (RULE NPAA0 "THATS IT"
28400        (*1 GOL)
28500        ((NAME OF GOL) = NOMO)
28600                    ***
28700                                (PRINT-OBJECTS)
28800                                (PRINT-ITM)
28900                                (PRINT-ITM-MED)
29000                                (PRINT-ITM-LONG)
29100                                (DEACT)
29200  ]
29300
29400  (RETURN &PAA)
29500  ]
```

FLL - Finish Line Linked
UPDP - Update Prime Direction and Position
UGIXL - Update GOL list IXL
FVL - Enter Vertex Linked
VIXL - Update IXL (of Vertex or Line)
CONL - CONtinue Line
MCRL - Move according to Current Reference of Line
BEGL - BEGin Line
FINL - FINish Line
MPL - Make Proposed Line
MEX - Move with EXpectation
ULIX - Update Last Inside XIT
MTR - Move To Review
MLI - Move Looking Inside
FIO - Finish Line for Overlay
UIR - Update Internal Range
MOL - Move Over Line
CPL - Check for Possible Link
CPLTO - Check for Possible Link To Outside
CEASTA - Check if Either Angle is STA
CAC - Check if At Com-appended chunk (complete)
CAPIL - Check at Possible Inside Link

```
00100  [PROG ()
00200
00300  [PROCESS AA
00400        (PS SE
00500
00600
00700
00800
00900
01000
01100
01200
01300
01400
01500
01600
01700
01800  ]
01900
02000  [RULE SEQ
02100        (#1
02200        ((NA
02300         #2
02400        ((T
02500        (CA
02600
02700
02800
02900
03000
03100
03200
03300
03400
03500  ]
03600
03700
03800
03900  [RULE S
04000        (
04100        ((
04200        ((
04300        ((
04400
04500
04600
04700
04800
04900
05000
05100
05200
05300  ]
05400
05500
```

A.RAAS

```
00100  [PROG ()
00200
00300  [PROCESS AAS-SYS
00400        (PS  SE000 SE00 SIL0 SE0A1 SE01 SE02 SE03 SE04 SE05
00500             SE06 SE07 SE08 IC01A IC01 IC02 SI01 SI02 SI03 SI04
00600             TFL1 TFL2 FPL1 FPL2 FPL3 FPL4 SNOIL1 SNOIL2
00700             MVIL1 MVIL2 MVIL3 LOV1 LOV2 LOV3 SIL1 SIL2 SIL3
00800             SIL4 SIL5 SIL6 SIL7 SIL8 SIL9 LO01 L002 L003 L004
00900             L005 L006 L007 LI01 LI02 LI03 LI04  MLIU1 MLIU2
01000             SN0000 SN000 SN00 NOM01 0001 SK2C1 SK021 SK0021 SU021
01100             SU0021 S001 K021 K022 K023 K024 K025 K026 K027 K028
01200             K029 K0210 K0211 U021 U022 U023 U024 U025 U026 U027
01300             U028 0001 K2C1 K2C2 K2C3 K2C4 K2C5 K2C6 K2C7 K2C8 K2C9
01400             K2C10 K2C11 K2C12  0021 0022 0023 0024 0025 0026 0027 0028
01500             0029 00210 00211 00212 00213
01600             TOL1 TOL2 TOL3 TOL4 TOX11 TOX12 TOX13 TOX14 TOX15 TOLA1
01700             TOLA2 TOLA3 TOX21 TOX22 TOX23 TOX24 TOX25 TOLL1 )
01800  ]
01900
02000  [RULE SE01 "BACK AT BEGINNING WITH ILINE"
02100        (#1: GOL $1)
02200        ((NAME OF GOL) = SE0)
02300        (#2: LAST $2)
02400        ((TYPE OF $2) = ILINE)
02500        (CAC $1 (PDIR OF GOL))
02600                  ==>
02700                       (EVL (PDIR OF GOL) #2: $2 $1)
02800                       (UPDP $1)
02900                       (PUTPROP GOL (LIST NIL) IXL)
03000                       (UGIXL)
03100                       (ALTER #2: LAST ← )
03200                       (ALTER #1: < LAST )
03300                       (PUTPROP GOL ICO NAME)
03400                       (# INC-SYS)
03500  ]
03600
03700
03800
03900  [RULE SE02 "BACK AT BEGINNING"
04000        (#1: GOL $1)
04100        ((NAME OF GOL) = SE0)
04200        (#2: LAST $2)
04300        (CAC $1 (PDIR OF GOL))
04400                  ==>
04500                       (EVL $2 $1)
04600                       (UPDP $1)
04700                       (PUTPROP GOL (LIST NIL) IXL)
04800                       (UGIXL)
04900                       (ALTER #2: LAST ← )
05000                       (ALTER #1: < LAST )
05100                       (PUTPROP GOL ICO NAME)
05200                       (# INC-SYS)
05300  ]
05400
05500
```

```
05600
05700
05800  [RULE SE03 "CONTINUE OUTSIDE LINE AS STA OUTSIDE"
05900        (=1: GOL $1)
06000        ((NAME OF GOL) = SEO)
06100        (=2: LAST $2)
06200        ((TYPE OF $2) = ILINE)
06300        ((ANG OF ((PDIR OF GOL) OF (CR OF (VI-REF)))) = STA)
06400                    ==>
06500                        (UIXL $2)
06600                        (CONL (PDIR OF GOL) =2: $2)
06700                        (MCRL $2)
06800                        (= VI-SYS)
06900  ]
07000
07100
07200
07300
07400  [RULE SE04 "BEGIN OUTSIDE LINE AS STA OUTSIDE"
07500        (=1: GOL $1)
07600        ((NAME OF GOL) = SEO)
07700        (=2: LAST $2)
07800        ((ANG OF ((PDIR OF GOL) OF (CR OF (VI-REF)))) = STA)
07900                    ==>
08000                        (NEW =3: ($3 <- (CREATE A LINE)))
08100                        (PUTPROP $3 (LIST NIL) 'ALL')
08200                        (UIXL $3)
08300                        (BEGL (PDIR OF GOL) =3: $3 $2)
08400                        (ALTER =2: LAST <-)
08500                        (ALTER =3: < LAST )
08600                        (MCRL $3)
08700                        (= VI-SYS)
08800  ]
08900
09000
09100
09200
09300  [RULE SE05
09400   "FINISH OUTSIDE LINE AS NOT STA"
09500        (=1: GOL $1)
09600        ((NAME OF GOL) = SEO)
09700        (=2: LAST $2)
09800        ((TYPE OF $2) = ILINE)
09900                    ==>
10000                        (UIXL $2 )
10100                        (FINL (PDIR OF GOL) =2: $2)
10200                        (UPDP $2)
10300                        (MCRL $2)
10400                        (= VI-SYS)
10500  ]
10600
10700
10800
10900
11000  [RULE SE06 " SEEMS A POSSIBLE INSIDE LINK MAKING LINE"
```

```
11100       (#1: GOL $1)
11200       ((NAME OF GOL) = SEO)
11300       (#2: LAST $2)
11400       ((SPEC OF (VI-REF)) = TE)
11500       (NULL (INX $2))
11600       (#3: COM $3)
11700       (CPL (INSIDE-XIT-OF-VI) (INX $3))
11800                   ==>
11900                       (#4: ← (NEW-STM))
12000                       (EVL $2 (VI-REF))
12100                       (PUTPROP GOL (OPPO OF  (PDIR OF GOL)) PDIR)
12200                       (UPDP (VI-REF))
12300                       (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
12400                       (MPL #3: $3 #4: (VI-REF))
12500                       (PUTPROP GOL FPL NAME)
12600                       (ALTER #3: COM ←)
12700                       (ALTER #2: LAST ←)
12800                       (ALTER #1: GOL ← )
12900                       (ALTER #4: < GOL)
13000                       (MORL (VI-REF))
13100                       (# VI-SYS)
13200   ]
13300
13400
13500   [RULE  SEO7 "SEES POSSIBLE INSIDE LINK"
13600       (#1: GOL $1)
13700       ((NAME OF GOL) =  SEO)
13800       (#2: LAST $2)
13900       (NOT ((SPEC OF (VI-REF)) = V2))
14000       (NULL (INX $2))
14100       (#3: COM $3)
14200       (CPL (INSIDE-XIT-OF-VI) (INX $3))
14300                   ==>
14400                       (EVL $2 (VI-REF))
14500                       (#4: ← (NEW-STM))
14600                       (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
14700                       (UPDP (VI-REF))
14800                       (PUTPROP $3 (INX $3) CR)
14900                       (PUTPROP GOL NAME TFL)
15000                       (ALTER #2: LAST ←)
15100                       (ALTER #4: < LAST)
15200                       (MEX $3)
15300                       (DIR ← (DVX OF (CR OF (VI-REF))))
15400                       (# VI-SYS)
15500   ]
15600
15700
15800
15900
16000
16100
16200   [RULE SE08 "ENTER  VERTEX ON OUTSIDE  "
16300       (#1: GOL $1)
16400       ((NAME OF GOL) = SEO)
16500       (#2: LAST $2)
```

```
16600                   ==>
16700                       (PUTPROP (VI-REF) (LIST NIL) IXL)
16800                       (UIXL (VI-REF) )
16900                       (EVL $2 (VI-REF))
17000                       (UPDP (VI-REF))
17100                       (=3 ← (NEW-STM))
17200                       (ALTER =2: LAST ←)
17300                       (ALTER =3: < LAST )
17400                       (ULIX =2: $2 )
17500                       (MCRL (VI-REF) )
17600                       (• VI-SYS)
17700   ]
17800
17900
18000   [RULE ICO1A "START REVIEWING OUTSIDE"
18100       (=1: LAST GOL $1)
18200       ((NAME OF GOL) = ICO)
18300       (NEED =2: $2 (HAS (LVX OF (CR OF $1))))
18400                   ==>
18500                       (ALTER =1: LAST ← )
18600                       (ALTER =2: < LAST)
18700                       (PUTPROP $2 (LVX OF (CR OF $1)) CR)
18800                       (MTR =2: $2)
18900                       (PUTPROP GOL $10 NAME)
19000                       (• VI-SYS)
19100   ]
19200
19300
19400
19500   [RULE ICO1 "CONTINUE OUTSIDE REVIEW"
19600       (=1: GOL )
19700       ((NAME OF GOL) = ICO)
19800       (=2: LAST $2)
19900       ((TYPE OF (CR OF $2)) = KEY)
20000       (NEED =3: $3 (HAS (LVX OF (CR OF $2))))
20100                   ==>
20200                       (ALTER =2: LAST ← )
20300                       (ALTER =3: < LAST)
20400                       (PUTPROP $3 (LVX OF (CR OF $2)) CR)
20500                       (MTR =3: $3)
20600                       (PUTPROP GOL $10 NAME)
20700                       (• VI-SYS)
20800   ]
20900
21000   [RULE ICO2 "CONTINUE REVIEWING OUTSIDE"
21100       (=1: GOL)
21200       ((NAME OF GOL) = ICO)
21300       (=2: LAST $2)
21400       ((TYPE OF (CR OF $2)) = KLX)
21500       (NEED =3: $3 (HAS (XLX OF (CR OF $2))))
21600                   ==>
21700                       (ALTER =2: LAST ← )
21800                       (ALTER =3: < LAST)
21900                       (PUTPROP $3 (LXX OF (CR OF $2)) CR)
22000                       (MTR =3: $3 )
```

```
                        (PUTPROP GOL SIO NAME)
                        (* VI-SYS)
]

[RULE SI01 "FINISH OUTSIDE REVIEW KNOWING A BUSY VERTEX"
        (=1: LAST GOL $1)
        ((NAME OF GOL) = SIO)
        ((EXP = YES) OR (EXP = CON))
        (NOT (NULL (IXV OF GOL)))
        (NEED =2: $2 (HAS (LVX OF (TRA (CR OF $1)  (PDIR OF GOL)))))
                    ==>
                        (UPDP $1)
                        (PUTPROP GOL (CDR (IXL OF GOL)) IXL)
                        (ALTER =1: LAST GOL ← )
                        (NEED =3: $3 (HAS (IXV OF GOL)))
                        (ALTER =4: < GOL)
                        (PUTPROP GOL MVIL NAME)
                        (PUTPROP $2 (LVX OF (CR OF $1)) CR)
                        (ALTER =2: < COM)
                        (MTR =2: $2)
                        (* VI-SYS)
]


[RULE SI02 "FINISH OUTSIDE REVIEW "
        (=1: LAST GOL $1)
        ((NAME OF GOL) = SIO)
        ((EXP = YES) OR (EXP = CON))
        (NEED =2: $2 (HAS (LVX OF (TRA (CR OF $1)  (PDIR OF GOL)))))
                    ==>
                        (UPDP $1)
                        (PUTPROP GOL (CDR (IXL OF GOL)) IXL)
                        (ALTER =1: LAST GOL ← )
                        (NEW INSIDE-GOL)
                        (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
                        (PUTPROP GOL SIL NAME)
                        (PUTPROP $2 (LVX OF (CR OF $1)) CR)
                        (ALTER =2: < COM)
                        (MLI =2: $2)
                        (* VI-SYS)
]

[RULE SI03 "SEE AS EXPECTED IN OUTSIDE REVIEW"
        (=1: GOL $1)
        ((NAME OF GOL) = SIO)
        ((EXP = YES) OR (EXP = CON))
        (=2: LAST $2)
                    ==>
                        (UGIXL $2)
                        (UPDP $2)
                        (PUTPROP GOL ICO NAME)
```

```
27600                          (* INC-SYS)
27700  ]
27800
27900
28000
28100
28200
28300  [RULE S104 "UNEXPECTED VIEW IN OUTSIDE REVIEW"
28400        (#1: GOL $1)
28500        ((NAME OF GOL) = S10)
28600        (EXP = NO)
28700                    ==>
28800                          (DEACT)
28900  ]
29000
29100
29200  [RULE  TFL1 "LINK IS REALIZED  TRY TO RECOGNIZE OBJECT"
29300        (#1: GOL $1)
29400        ((NAME OF GOL) = TFL)
29500        (#2: LAST $2)
29600        (EXP = YES)
29700        (#3: COM $3)
29800                    ==>
29900                          (EVL $2 $3)
30000                          (UPDP $3)
30100                          (ALTER #1: GOL ← )
30200                          (NEW  #4: GOL)
30300                          (REMPROP GOL LINK)
30400                          (PUTPROP GOL RNO NAME)
30500                          (ALTER #2: LAST ← )
30600                          (ALTER #3: COM ← LAST)
30700                          (* REC-SYS)
30800  ]
30900
31000
31100
31200  [RULE TFL2 "LINK NOT REALIZED  GO BACK "
31300        (#1: GOL $1)
31400        ((NAME OF GOL) = TFL)
31500        (EXP = NO)
31600        (#2: LAST $2)
31700                    ==>
31800                          (MEX $2)
31900                          (DIR ← (OPPO OF 'DVX  OF (CR OF  $2))))
32000                          (PUTPROP GOL SEOA NAME)
32100                          (* V1-SYS)
32200  ]
32300
32400
32500
32600
32700  [RULE SEOA1 "RETURN TO OUTSIDE SEARCH"
32800        (#1: GOL $1)
32900        ((NAME OF GOL) = SEOA)
33000        (EXP = YES)
```

```
33100        (*2: LAST $2)
33200                    ==>
33300                         (UPDP $2)
33400                         (PUTPROP GOL (OPPO OF (POIF OF GOL)) PDIR)
33500                         (UIXL $2)
33600                         (UPDP $2)
33700                         (MCRL $1)
33800                         (PUTPROP GOL SEO NAME)
33900                         (* VI-SYS)
34000  ]
34100
34200
34300
34400
34500
34600  [RULE FPL1 "HAVE MOVED TO PROPOSED LINE END"
34700        (*1: GOL $1)
34800        ((NAME OF GOL) = FPL)
34900        (NULL EXP)
35000                    ==>
35100                         (FLO $1)
35200                         (*2: ← (NEW-STM))
35300                         (PUTPROP $1 (LEL OF (LIX OF (CR OF $1))) CR)
35400                         (MOL $1)
35500                         (* VI-SYS)
35600  ]
35700
35800
35900
36000
36100  [RULE FPL2 "LINK LINE REALIZED  MOVE TO NEW OBJECT START"
36200        (*1: GOL $1)
36300        ((NAME OF GOL) = FPL)
36400        ((EXP = CON) OR (EXP = YES))
36500        (*2: COM $2)
36600                    ==>
36700                         (UIR ((PDIR OF GOL) OF (CR OF $1)))
36800                         (PUTPROP GOL (OPPO OF (POIR OF GOL)) PDIR)
36900                         (PUTPROP GOL SNOIL NAME)
37000                         (MOL $1)
37100                         (* VI-SYS)
37200  ]
37300
37400
37500
37600  [RULE FPL3  "LINK LINE REALIZED AT NEW  OBJECT START"
37700        (*1: GOL $1)
37800        ((NAME OF GOL) = FPL)
37900        (EXP = CON)
38000                    ==>
38100                         (UIR ((PDIR OF GOL) OF (XLL OF (CR OF $1))))
38200                         (PUTPROP GOL (OPPO OF  (PDIR OF GOL)) POIR)
38300                         (UPDP $1)
38400                         (ALTER  *1: GOL ← )
38500                         (NEW  *2: GOL)
```

```
                        (REMPROP GOL LINK)
                        (PUTPROP GOL RNO NAME)
                        (* REC-SYS)
]

[RULE FPL4 "TROUBLE IN LINKING LINE"
        (#1: GOL $1)
        ((NAME OF GOL) = FPL)
        (EXP = NO)
                    ==>
                        (DEACT)
]


[RULE SNOIL1 "REACH NEW OBJECT START LOCATION"
        (#1: GOL $1)
        ((NAME OF GOL) = SNOIL)
        (EXP = CON)
                    ==>
                        (UPDP $1)
                        (PUTPROP $1 (OPPO OF (PDIR OF GOL)) PDIR)
                        (ALTER #1: GOL ←)
                        (NEW #2: GOL)
                        (REMPROP GOL LINK)
                        (PUTPROP GOL RNO NAME)
                        (* REC-SYS)
]


[RULE SNOIL2 "TROUBLE IN REACHING START LOCATION"
        (#1: GOL $1)
        ((NAME OF GOL) = SNOIL)
        (EXP = NO)
                    ==>
                        (DEACT)
]


[RULE MVIL1 "REACH BUSY VERTEX"
        (#1: COM GOL $1)
        ((NAME OF GOL) = MVIL)
        ((EXP = YES) OR (EXP = CON))
                    ==>
                        (ALTER #1: COM ←)
                        (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
                        (UPDP $1)
                        (MORL $1)
                        (PUTPROP GOL LOV NAME)
                        (* VI-SYS)
]
```

```
44100
44200  [RULE MVIL2 "CONTINUE MOVING TO BUSY VERTEX"
44300        (#1: GOL $1)
44400        ((NAME OF GOL) = MVIL)
44500        ((EXP = YES) OR (EXP = CON))
44600        (#2: COM $2)
44700                    ==>
44800                         (ALTER #2 COM ←)
44900                         (UPDP $2)
45000                         (IF← ((TYPE OF (CR OF $2)) = KEX) THEN
45100                               (NEED #3: $3 (HAS (LVX OF (CR OF $2))))
45200                               (PUTPROP $3 (LVX OF (CR OF $2)) CR)
45300                         )
45400                         (IF← ((TYPE OF (CR OF $2)) = KLX) THEN
45500                               (NEED #3: (HAS (XLX OF (CR OF $2))))
45600                               (PUTPROP $3 (XLX OF (CR OF $2)) CR)
45700                         )
45800                         (ALTER #3: < COM)
45900                         (MTR #3 $3)
46000                         (← VI-SYS)
46100  ]
46200
46300
46400
46500
46600
46700  [RULE MVIL3 "TROUBLE MOVING TO BUSY VERTEX"
46800        (#1: GOL)
46900        ((NAME OF GOL) = MVIL)
47000                    ==>
47100                         (DEACT)
47200  ]
47300
47400
47500
47600
47700  [RULE LOV1 "AT ANOTHER INSIDE LINK"
47800        (#1: GOL $1)
47900        ((NAME OF GOL) = LOV)
48000        (NULL EXP)
48100        (CAPIL (VI REF))
48200        (NEED #2: $2 (HAS CAPIL))
48300                    ==>
48400                         (PUTPROP $2 CAPIL CR)
48500                         (EVL $1 $2)
48600                         (REMOVE-LINK $1 $2)
48700                         (PUTPROP GOL SIL NAME)
48800                         (UPDP $2)
48900                         (MLI)
49000                         (← VI-SYS)
49100  ]
49200
49300
49400
49500
```

```
49600  [RULE LOV2 "NOT AT ANOTHER LINK SO  GO BACK"
49700        (#1: GOL $1)
49800        ((NAME OF GOL) = LOV)
49900        (NULL EXP)
50000                    ==>
50100                        (MEX $1)
50200                        (DIR ← (OPPO OF (DVX OF (CR OF $1))))
50300                        (* VI-SYS)
50400  ]
50500
50600
50700  [RULE LOV3 "BACK AT VERTEX SEARCH FOR INSIDE LINK"
50800        (#1: GOL $1)
50900        ((NAME OF GOL) = LOV)
51000        (EXP = YES)
51100                    ==>
51200                        (UPDP $1)
51300                        (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
51400                        (UPDP $1)
51500                        (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
51600                        (PUTPROP GOL SIL NAME)
51700                        (MEX $1)
51800                        (* VI-SYS)
51900  ]
52000
52100
52200
52300  [RULE  SIL0 "COMPLETE PICTURE PERCEPTION"
52400        (#1: GOL)
52500        ((NAME OF GOL) = SIL)
52600        (NULL (IXL OF GOL))
52700                    ==>
52800                        (DEACT)
52900  ]
53000
53100
53200
53300  [RULE SIL1 "AT A JUNCT WITH POSSIBLE KNOWN LINK"
53400        (#1: GOL)
53500        ((NAME OF GOL) = SIL)
53600        ((EXP  = YES) OR (EXP = CON))
53700        (#2: COM $2)
53800        (IS-UNKNOWN-INKIT (CR OF $2))
53900        (CPLTO (CR OF $2))
54000                    ==>
54100                        (NEED #3: $3 (HAS CPLTO))
54200                        (ALTER #1: GOL ←)
54300                        (PUTPROP $3 CPLTO CR)
54400                        (ALTER #2: COM ← GOL)
54500                        (ALTER #3: < COM)
54600                        (PUTPROP GOL LOO NAME)
54700                        (MEX $3)
54800                        (DIR ← (DVX OF (CR OF $2)))
54900                        (* VI-SYS)
55000  ]
```

```
55100
55200
55300  [RULE SIL2 "AT A INXIT BUT NO KNOWN POSSIBLE LINK"
55400       (#1: GOL)
55500       ((NAME OF GOL) = SIL)
55600       ((EXP = YES) OR (EXP = CON))
55700       (#2: COM $2)
55800       (IS-UNKNOWN-INXIT (CR OF $2))
55900                   ==>
56000                         (ALTER #1: GOL ←)
56100                         (ALTER #2: COM ← GOL)
56200                         (PUTPROP GOL LOU NAME)
56300                         (MCRL $2)
56400                         (* VI-SYS)
56500  ]
56600
56700
56800  [RULE SIL3 "AT A SIMPLE VERTEX NO INXIT"
56900       (#1: GOL)
57000       ((NAME OF GOL) = SIL)
57100       ((EXP = YES) OR (EXP = CON))
57200       (#2: COM $2)
57300       ((TYPE OF $2) = VERTEX)
57400       ((SPEC OF $2) = V2)
57500                   ==>
57600                         (IF* ((TYPE OF (CR OF $2)) = KEX) THEN
57700                               (NEED #3: $3 (HAS (LVX OF (CR OF $2))))
57800                               (PUTPROP $3 (LVX OF (CR OF $2)) CR)
57900                         )
58000                         (IF* ((TYPE OF (CR OF $2)) = KLX) THEN
58100                               (NEED #3: (HAS (XLX OF (CR OF $2))))
58200                               (PUTPROP $3  (XLX OF (CR OF $2)) CR)
58300                         )
58400                         (ALTER* #2: COM ←)
58500                         (ALTER #3: < COM)
58600                         (MLI #3: $3)
58700                         (* VI-SYS)
58800  ]
58900
59000
59100
59200
59300
59400  [RULE SIL4 "AT VERTEX NO INXIT UNKNOWN"
59500       (#1: GOL)
59600       ((NAME OF GOL) = SIL)
59700       ((EXP = YES) OR (EXP = CON))
59800       (#2: COM $2)
59900       ((TYPE OF $2) = VERTEX)
60000       (NOT ((SPEC OF $2) = MU))
60100                   ==>
60200                         (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
60300                         (UPDP $2)
60400                         (IF* ((TYPE OF (CR OF $2)) = KEX) THEN
60500                               (NEED #3: $3 (HAS (LVX OF (CR OF $2))))
```

```
60600                           (PUTPROP $3 (LVX OF (CR OF $2)) CR)
60700                       )
60800                       (IF* ((TYPE OF (CR OF $2)) = KLX) THEN
60900                           (NEED *3: (HAS (KLX OF (CR OF $2))))
61000                           (PUTPROP $3 (KLX OF (CR OF $2)) CR)
61100                       )
61200                       (ALTER *2: COM +)
61300                       (ALTER *3: < COM)
61400                       (MLI *3: $3)
61500                       (* VI-SYS)
61600   ]
61700
61800
61900
62000   [RULE SIL5 "AT LINE END SIMPLE VERTEX NO INXIT"
62100       (*1: GOL)
62200       ((NAME OF GOL) = SIL)
62300       ((EXP = YES) OR (EXP = CON))
62400       (*2: COM $2)
62500       ((TYPE OF $2) = LINE)
62600       (NULL (VER OF (CR OF $2)))
62700       ((SPEC OF (VER OF $2)) = V2)
62800                   -->
62900                       (IF* ((TYPE OF (CR OF $2)) = KLX) THEN
63000                           (NEED *3: $3 (HAS (LVX OF (CR OF $2))))
63100                           (PUTPROP $3 (LVX OF (CR OF $2)) CR)
63200                           (MLI *3: $3)
63300                           (ALTER *2: COM +)
63400                           (ALTER *3: < COM)
63500                       )
63600                       (IF* ((TYPE OF (CR OF $2)) = KLX) THEN
63700                           (NEED *3: (HAS (KLX OF (CR OF $2))))
63800                           (PUTPROP $3 (KLX OF (CR OF $2)) CR)
63900                           (MLI *3: $3)
64000                           (ALTER *2: COM +)
64100                           (ALTER *3: < COM)
64200                       )
64300                       (IF* ((TYPE OF (CR OF $2)) = KLL) THEN
64400                           (PUTPROP $2 (KLL OF (CR OF $2)) CR)
64500                           (MLI *2. $2)
64600                       )
64700                       (* VI-SYS)
64800   ]
64900
65000
65100   [RULE SIL6 "AT LINE END NON-SIMPLE VERTEX NO UNKNOWN INXIT"
65200       (*1: GOL)
65300       ((NAME OF GOL) = SIL)
65400       ((EXP = YES) OR (EXP = CON))
65500       (*2: COM $2)
65600       ((TYPE OF $2) = LINE)
65700       (NULL (VER OF (CR OF $2)))
65800       (NOT ((SPEC OF (VER OF $2)) = MU))
65900                   -->
66000                       (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
```

```
                    (UPDP $2)
                    (IF * ((TYPE OF (CR OF $2)) = KEX) THEN
                          (NEED *3: $3 (HAS (LVX OF (CR OF $2))))
                          (PUTPROP $3 (LVX OF (CR OF $2)) CR)
                          (MLI *3: $3)
                          (ALTER *2: COM +)
                          (ALTER *3: < COM)
                    )
                    (IF * ((TYPE OF (CR OF $2)) = KLX) THEN
                          (NEED *3: (HAS (XLX OF (CR OF $2))))
                          (PUTPROP $3  (XLX OF (CR OF $2)) CR)
                          (MLI *3: $3)
                          (ALTER *2: COM +)
                          (ALTER *3: < COM)
                    )
                    (IF * ((TYPE OF (CR OF $2)) = KLL) THEN
                          (PUTPROP $2 (XLL OF (CR OF $2)) CR)
                          (MLI *2: $2)
                    )
                    (* VI-SYS)
]


[RULE S1L7 "AT FIRST INAIT OF K LINE VERTEX CONSIDER OTHER"
      (*1: GOL)
      ((NAME OF GOL) = S1L)
      ((EXP = YES) OR (EXP = CON))
      (*2: COM $2)
      ((TYPE OF $2) = LINE)
      ((VER OF (CR OF $2)) = K1)
                  -->
                        (PUTPROP (CR OF $2) KP VER)
                        (PUTPROP GOL (OPPO OF (PDIR OF GOL)) GOL)
                        (UPDP $2)
]


[RULE S1L8 "LINE VERTEX HAS NO UNKNOWN INXIT"
      (*1: GOL)
      ((NAME OF GOL) = S1L)
      ((EXP = YES) OR (EXP = CON))
      (*2: COM $2)
      ((TYPE OF $2) = LINE)
                  -->
                        (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
                        (UPDP $2)
                        (MLI *2: $2)
]
```

```
71600
71700  [RULE SIL9 "TROUBLE IN SEACHING VI NOT EXP"
71800        (=1: GOL)
71900        ((NAME OF GOL) = SIL)
72000        (EXP = NO)
72100                    =>
72200                         (DEACT)
72300  ]
72400
72500
72600
```

```
00100
00200
00300
00400
00500  (RULE  L001 "COMPLETE EXPECTED LINK WITH LINE"
00600        (#1: GOL $1)
00700        ((NAME OF GOL) = L00)
00800        (EXP = YES)
00900        ((TYPE OF $1) = ILINE)
01000        (#2: COM $2)
01100        (CAC $2 (PDIR OF GOL))
01200                    ==>
01300                         (FLL (PDIR OF GOL) #1: $1 $2)
01400                         (REMOVE (CR OF $2) (IXL OF  GOL))
01500                         (PUTPROP GOL (OPPO OF (PDIR OF GOL)) PDIR)
01600                         (MOL #1: $1)
01700                         (PUTPROP  GOL MLIU NAME)
01800                         (* VI-SYS)
01900  )
02000
02100
02200
02300
02400
02500  (RULE L002 "EXPECTED LINK IS REALIZED"
02600        (#1: GOL $1)
02700        ((NAME OF GOL) = L00)
02800        (EXP = YES)
02900        (#2: COM $2)
03000        (CAC $2 (PDIR OF GOL))
03100                    ==>
03200                         (EVL $1 $2)
03300                         (REMOVE (CR OF $1) (IXL OF GOL))
03400                         (REMOVE (CR OF $2) (IXL OF GOL))
03500                         (ALTER #1: GOL ←)
03600                         (ALTER #2: COM ←)
03700                         (NEW #3: GOL)
03800                         (PUTPROP GOL SIL NAME)
03900                         (MLI #2: $2)
04000                         (* VI-SYS)
04100  )
04200
04300
04400
04500  (RULE  L003 "CONTINUE INSIDE LINE"
04600        (#1: GOL $1)
04700        ((NAME OF GOL) = L00)
04800        (EXP = NO)
04900        ((TYPE OF $1) = ILINE)
05000        ((ANG OF ((PDIR OF GOL) OF (CR OF (VI-REF)))) = STA)
05100        (#2: COM $2)
05200                    ==>
05300                         (CONL (PDIR OF GOL) #1: $1)
05400                         (MEX $2)
05500                         (DIR ← (OPPO OF (DVX OF (CR OF $2))))
```

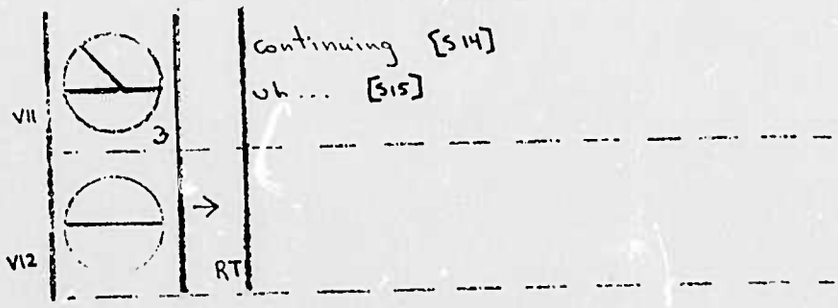
```
05600                          (# VI-SYS)
05700  ]
05800
05900
06000
06100  [RULE  L004 "PROBLEM IN REACHING LINK EXPECTED"
06200         (#1: GOL $1)
06300         ((NAME OF GOL) = L00)
06400         (EXP = NO)
06500         ((TYPE OF $1) = ILINE)
06600                      ==>
06700                           (DEACT)
06800  ]
06900
07000
07100
07200  [RULE L005 "INTERNAL VERTEX GIVES NEW LINK IDEA"
07300         (#1: GOL $1)
07400         ((NAME OF GOL) = LOC)
07500         (EXP = NO)
07600         (CEASTA (VI-REF))
07700         (#2: COM $2)
07800         (CPLTO ((OPPO OF (PDIP OF GOL)) OF ((OPPO OF (PDIR OF GOL)) OF (CR OF (VI-REF)))) )
07900         (NEED #3: $3 (HAS CPLTO))
08000                      ==>
08100                           (REMOVE (CR OF $1) (IXL OF GOL))
08200                           (REMOVE (CR OF $2) (IXL OF GOL))
08300                           (NEW #4: ($4 ← [CREATE A LINE]))
08400                           (BEGL (PDIR OF GOL) #4: $4 $1)
08500                           (FLL (PDIR OF GOL) #4: $4  $2)
08600                           (PUTPROP $4 ((OPPO OF (POIR OF GOL)) OF ((OPPO OF (PDIR OF GOL)) OF
08700                           (ALTER #1: GOL ←)
08800                           (ALTER #4  $4 ← $4  OGOL)
08900                           (ALTER #3: ← COM)
09000                           (ALTER #2: COM ← LAST)
09100                           (PUTPROP (GOL LIO NAME)
09200                           (NEW #5: GOL)
09300                           (PUTPROP GOL RIO NAME)
09400                           (REMPROP GOL LINK)
09500                           (MEK $3)
09600                           (DIR ← (DVX OF (CR OF $4)))
09700                           (# VI-SYS)
09800                           (# REC-SYS)
09900  ]
10000
10100
10200  [RULE L006 "INSIDE LINE STARTED"
10300         (#1: GOL $1)
10400         ((NAME OF GOL) = L00)
10500         (EXP = NO)
10600         (CEASTA (VI-REF))
10700         (#2: COM $2)
10800                      ==>
10900                           (NEW #3: ($3 ← [CREATE A LINE]))
11000                           (BEGL  (PDIR OF GOL) #3: $3 $1)
```

```
                        (REMOVE (CR OF $1) (IXL OF GOL))
                        (ALTER *1: GOL ←)
                        (ALTER *3: GOL ←)
                        (MEX $2)
                        (DIR ← (OPPO OF (DVX OF (CR OF $2))))
                        (* VI-SYS)
]


[RULE L007 "TROUBLE WITH EXPECTED LINK"
        (*1: GOL $1)
        ((NAME OF GOL) = L00)
        (EXP = NO)
                ==>
                        (DEACT)
]


[RULE LI01 "EXPECTED LINK REALIZED  WITH LINE"
        (*1: GOL $1)
        ((NAME OF GOL)  = LI0)
        (EXP = YES)
        ((TYPE OF $1) = ILINE)
        (*2: COM $2)
        (CAC $2 (PDIR OF GOL))
                ==>
                        (FLL (PDIR OF GOL) *1: $1 $2)
                        (REMOVE (CR OF $2) (IXL OF  GOL))
                        (PUTPROP  GOL (OPPO OF (PDIR OF GOL)) PDIR)
                        (MOL *1: $1)
                        (PUTPROP  GOL [illegible]U NAME)
                        (* VI-SYS)
]
[RULE  LI02 "EXPECTED LINK REALIZED"
        (*1: GOL $1)
        ((NAME OF GOL) = LI0)
        (EXP = YES)
        (*2: COM $2)
        (CAC $2 (PDIR OF GOL))
                ==>
                        (EVL $2 $1)
                        (REMOVE (CR OF $2) (IXL OF GOL))
                        (PUTPROP $2 ((PDIR OF GOL) OF ((PDIR OF GOL) OF (CR OF $2))) CF
                        (PUTPROP GOL IIC NAME)
                        (ML1 *2: $2)
                        (ALTER *1: GOL ← LAST)
                        (NEW *3: GOL)
                        (* VI-SYS)
                        (* INC-SYS)
]
```

```
16600
16700  [RULE  LIO3 "STA  SO START A INSIDE LINE"
16800        (#1: GOL $1)
16900        ((NAME OF GOL) = LIO)
17000        (EXP = NO)
17100        (CEASTA (VI-REF))
17200        (#2: COM $2)
17300                    ==>
17400                         (NEW #3: ($3 ← [CREATE A LINE]))
17500                         (BEGL  (PDIR OF GOL) #3: $3 $1)
17600                         (ALTER #1: GOL ← LAST)
17700                         (ALTER #3: GOL ←)
17800                         (MEX $2)
17900                         (DIR ← (OPPO OF (DVX OF (CR OF $2))))
18000                         (PUTPROP GOL  IIC NAME)
18100                         (* VI-SYS)
18200                         (* INC SYS)
18300  ]
18400
18500
18600
18700
18800  [RULE LIO4  "TROUBLE REACHING EXPECTED LINK"
18900        (#1: GOL $1)
19000        ((NAME OF GOL) = LIO)
19100        (EXP = NO)
19200                    ==>
19300                         (DEACT)
19400  ]
19500
19600
19700
19800
19900
20000  [RULE MLIU1 " INSIDE XIT HAS POSSIBLE KNOWN LINK"
20100        (#1: GOL $1)
20200        (NAME OF GOL) = MLIU)
20300        (EXP = CON)
20400        (CPLTO (CR OF $1))
20500                    ==>
20600                         (NEED #2: $2 (HAS CPLTO))
20700                         (PUTPROP $2 CPLTO CR)
20800                         (ALTER #2: < COM)
20900                         (PUTPROP GOL LIO NAME)
21000                         (MEX $2)
21100                         (DIR ← (DVX OF (CR OF $1)))
21200                         (* VI-SYS)
21300  ]
21400
21500
21600  [RULE  MLIU2 "INSIDE XIT HAS NO KNOWN LINK)
21700        (#1: GOL $1)
21800        ((NAME OF GOL) = MLIU)
21900        (EXP = CON)
22000                    ==>
```

```
                                (PUTPROP GOL LIU NAME)
                                (MCRL $1)
                                (* VI-SYS)
]


[RULE SE000 "THIS IS THE START RULE"
        (EXP = F1)
        (NULL V1)
                        ==>
                                (* VI-SYS)
]


[RULE SE00 "SEE FIRST VISUAL INFO"
        (EXP = F1)
                        ==>
                                (#1 = (NEW-STM))
                                (ALTER #1 = GOL)
                                (PUTPROP GOL SE0 NAME)
                                (PUTPROP GOL ATT PDIR)
                                (UXL (VI-REF))
                                (UPOP (VI-REF))
                                (MCRL (VI-REF))
                                (* VI-SYS)
]

(RETURN #RAAS)
]
```

Appendix
A.P1



AT VERTEX VER3.

GOAL-IS: RNO
17,0 STM: (GOL)
(LAST V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTE~
X)(P25 X26 A31 X30 A29 X28 A27))
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)(P49 X5~
0 A55 X54 A53 X52 A51))
(L37(CR E38 VSPEC DIAGONAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V3(CR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)
() () ()

ACT #64: REC-SYS.

RULE RECO: BEGIN RECOGNITION OF NEW OBJECT.

GOAL-IS: RNO
18,0 STM: (GOL O65(DIM TWO NUMS ONE TYPE OBJECT)(P25 I66 A67 ~
I68))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27))
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)(P49 X5~
0 A55 X54 A53 X52 A51))
(L37(CR E38 VSPEC DIAGONAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V3(CR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)
() () ()

RULE REC12: ENTER OBJECT AT AN ANGLE.

GOAL-IS: RNO
19,0 STM: (GOL O65(DIM TWO NUMS ONE TYPE OBJECT)(P25 I66 A67 ~
I68))
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)(P4 I11~
A12 I13 I14 A15 I16 P25 I33 A34 I35 P49))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27))
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)
(L37(CR E38 VSPEC DIAGONAL TYPE SIDE)...)
(V3(CR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)
() () ()

RULE REC5: ENTER SIDE AT AN END

GOAL-IS: RN0

20,0 STM: (GOL 06E: DIM TWO NUMS ONE TYPE OBJECT)(P25 166 A~
168 169 A70 171))

(COM L3 7(OR Q43 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 ~
E38 140 141 Q43 144 145 E47))

(O1D(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)(P4 111~
A12 113 114 A15 116 P25 133 A34 135 P49))

(V28(OR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)

(V46(OR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

(V5(OR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)

( ) ( ))

RULE REC1: NO MORE MEMORY INFORMATION

GOAL-IS: SU02

X1.0 STM: (GOL 06E: DIM TWO TYPE OBJECT) P25 166 A~1 168 169 A~
70 171))

(COM L3 (OR Q43 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 ~
E38 140 141 Q43 144 145 E47))

(O1D(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)(P4 111~
A12 113 114 A15 116 P25 133 A34 135 P49))

(V28(OR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)

(V46(OR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

(V5(OR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)

( ) ( ))

ACT *1: AA-SYS

RULE SU020: START LOOKING FOR UNKNOWN OBJECT INFO.

ACT *72: VI-SYS

RULE V12: ONLY DIR IS SPECIFIED

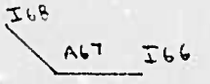
DIR IS RT

RAN IS NIL

EXP IS NIL

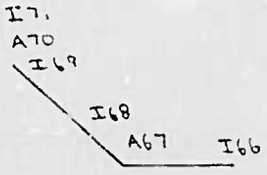
ATT IS NIL

VI IS NIL



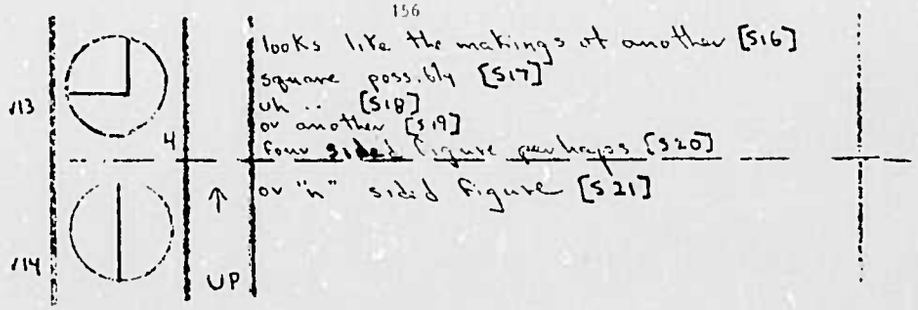
065 (a)

(18,0)



065 (b)

(20,0)



AT VERTEX VER4.

DIR IS RT

RAN IS ME

EXP IS NIL

ATT IS NIL

VI IS (V73 P74 X75 A78 X77 A76)

GOAL-IS: U02
23,0 STM: (GOL O65(DIM TWO TYPE OBJECT)(P25 I56 A67 I68 I69 A~
70 I71))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27))
(COM L37(CR Q43 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 ~
E38 I40 I41 Q43 I44 I45 E47))
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)
(V3(CR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)
) () ()

ACT #1: AA-SYS.

RULE U028: NEW CORNER.

ACT #82: VI-SYS.

RULE V12: ONLY DIR IS SPECIFIED.

DIR IS UP

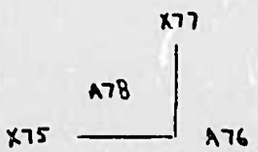
RAN IS NIL

EXP IS NIL

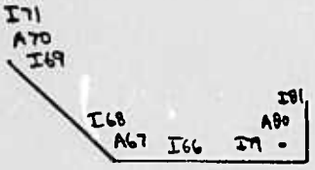
ATT IS NIL

VI IS NIL

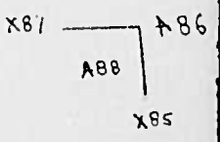
AT VERTEX VER5.



V73
(25,0)



065 (c)
(25,0)



DIR IS UP

RAN IS ME

EXP IS NIL

ATT IS NIL

VI IS (V53 P84 X85 A88 X87 A86)

GOAL-IS: UO2
P5,0 STM: (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX~
(P74 X75 A78 X77 A76))
(GOL O65(DIM TWO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 ~
P74 I79 A80 I81))
(V24(CR X30 PNUM P25 VSPEC (DL DL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27))
(COM L37(CR Q43 VSPEC DIAGONAL TYPE SIDE))
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)
(V3(CR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)
() ()

ACT #1: AA-SYS.

RULE UO28: NEW CORNER.

ACT #92: VI-SYS.

RULE VI2: ONLY DIR IS SPECIFIED.

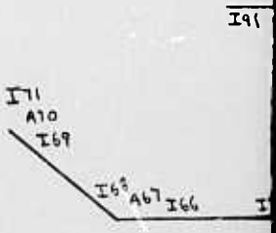
DIR IS LE

RAN IS NIL

EXP IS NIL

ATT IS NIL

VI IS NIL

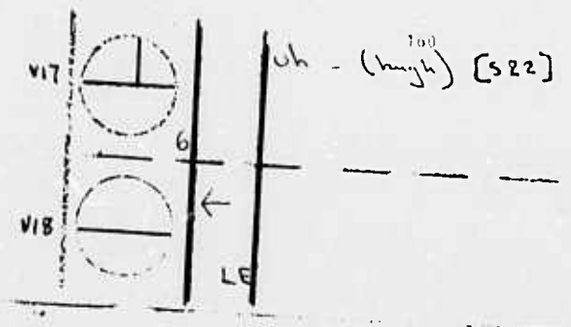


V 83

(27,0)

065 (d)

(27,0)



AT VERTEX VER6

DIR IS LE

RAN IS ME

EXP IS NIL

ATT IS NIL

VI IS (V93 P94 X95 A100 X99 A98 X97 A96)

GOAL-IS: G02
27,0 STM. (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX~
)(P84 X85 A83 X87 A86))
(GOL G65;DIM TWO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 ~
P74 I79 A80 I81 P84 I89 A90 I91))
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)(P74 X~
75 A78 X77 A76))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(COM L37(CR Q43 VSPEC DIAGONAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)
(V3(CR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)
()

ACT *1: AA-SYS.

RULE 0026: STA SIGNALS SIDE BEGIN.

ACT *106: VI-SYS.

RULE VI2: ONLY DIR IS SPECIFIED.

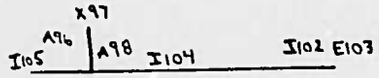
DIR IS LE

RAN IS NIL

EXP IS NIL

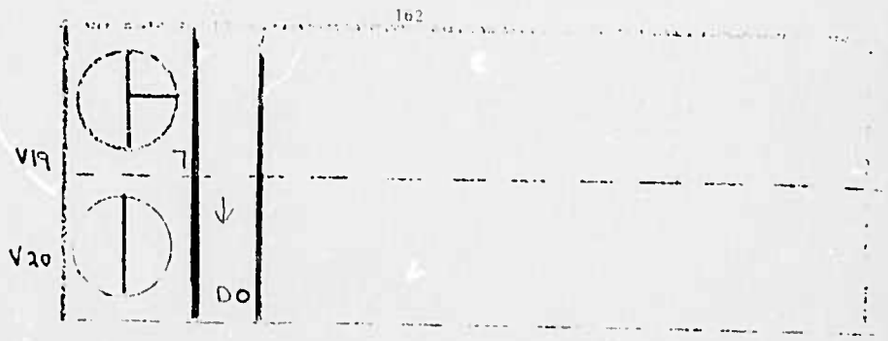
ATT IS NIL

VI IS NIL



S101 (a)

(29,0)



AT VERTEX VER7.

DIR IS LE

RAN IS SH

EXP IS NIL

ATT IS NIL

VI IS (V107 P108 X109 A114 X113 A112 X111 A110)

GOAL-IS: U02
29.0 STM: (S101(GP I105 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I102~
I104 P94 I104 A98 X97 A96 I105))
(GOL O65(DIM TWO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 ~
P74 I79 A80 I81 P84 I89 A90 I91))
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)(P84 X~
85 A86 X87 A86))
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(COM L37(CR Q43 VSPEC DIAGONAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)
(V3(CR X5 PNUM P4 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)...)

ACT #1: AA-SYS

RULE U027: SIDE IS COMPLETED NEW CORNER.

ACT #120: VI-SYS

RULE V12: ONLY DIR IS SPECIFIED.

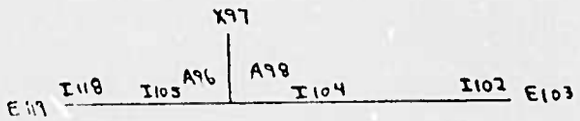
DIR IS DO

RAN IS NIL

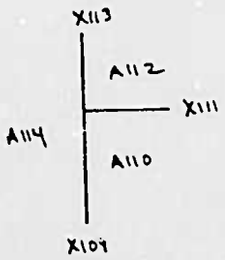
EXP IS NIL

ATT IS NIL

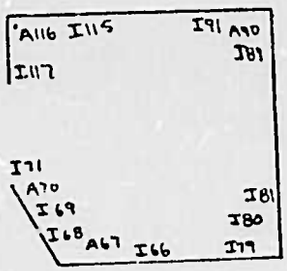
VI IS NIL



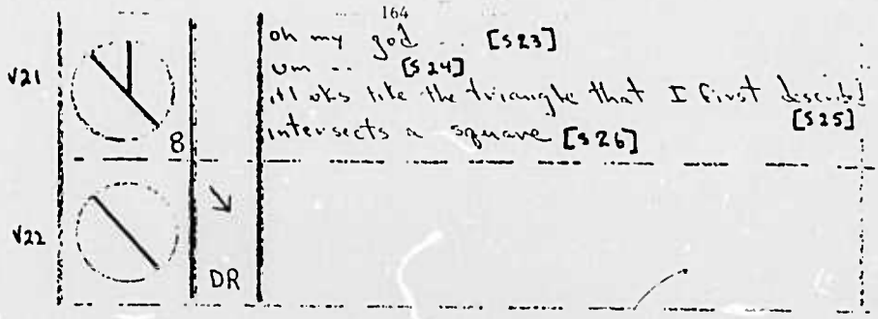
S101 (6)
(31,0)



V107
(31,0)



065 (e)
(31,0)



AT VERTEX VER8

DIR IS DO

RAN IS SH

EXP IS NIL

ATT IS NIL

VI IS (V121 P122 X123 A128 X127 A126 X125 A124)

GOAL-IS: U02
31,0 STM: (V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERT~
EX)(P108 X109 A114 X113 A112 X111 A110))
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I102 I104 P~
94 I104 A98 X97 A96 I105 P108 I118 E119))
(GOL O65(DIM TWO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 ~
P74 I79 A80 I81 P84 I89 A90 I91 P108 I115 A116 I117))
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(COM L37(CR Q43 VSPEC DIAGONAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

ACT #1: AA-SYS.

RULE U024: OUTLINE COMPLETED.

GOAL-IS: RUC
32,0 STM: (GOL O65(DIM TWO TYPE OBJECT)(P25 I66 A67 I68 I69 A~
70 I71 P74 I79 A80 I81 P84 I89 A90 I91 P108 I115 A116 I117))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 I40~
I41 I44 I45 E47 A126 A124 X125))
(V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110))
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)

ACT #129: REC-SYS.

RULE RUC4: REVIEW A CORNER OF MODEL

```
GOAL-IS: RUC
   33,0      STM: (GOL    065(NUMS ONE DIM TWO TYPE OBJECT)(P25 166 A67 ~
168 169 A70 171 P74 179 A80 181 P84 189 A90 191 P108 1115 A116 1117)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 140~
141 144 145 E47 A126 A124 X125)    )
          (V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110)    )
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)... )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)... )
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)... )
          (O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)... )
          (V48(CR X50 PNUM P49 VSPEC (UD OR) SPEC TE TYPE VERTEX)... )
```

RULE RUC4: REVIEW A CORNER OF MODEL.

```
GOAL-IS: RUC
   34,0      STM: (GOL    065(NUMS TWO DIM TWO TYPE OBJECT)(P25 166 A67 ~
168 169 A70 171 P74 179 A80 181 P84 189 A90 191 P108 1115 A116 1117)    )
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 140~
141 144 145 E47 A126 A124 X125)    )
          (V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~
)
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)... )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)... )
          (O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)... )
          (V48(CR X50 PNUM P49 VSPEC (UO OR) SPEC TE TYPE VERTEX)... )
```

RULE RUC4: REVIEW A CORNER OF MODEL.

```
GOAL-IS: RUC
   35,0      STM: (GOL    065(NUMS THREE DIM TWO TYPE OBJECT)(P25 166 A6~
7 168 169 A70 171 P74 179 A80 181 P84 189 A90 191 P108 1115 A116 1117)    )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)(P74 X~
75 A78 X77 A76)    )

          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~
)
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)... )
          (O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)... )
          (V48(CR X50 PNUM P49 VSPEC (UO OR) SPEC TE TYPE VERTEX)... )
```

```
GOAL-IS: RUC
   36,0       STM: (GOL     O65(NUMS FOUR DIM TWO TYPE OBJECT)(P25 I66 A67~
168 I69 A70 I71 P74 I79 A80 IS1 P84 I89 A90 I91 P108 I115 A116 I117)     )
          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)(P84 X~
85 A88 X87 A86)     )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)(P74 X~
75 A78 X77 A76)     )
          (V24(CR X30 PNUM P25 VSREC (RL UL) SPEC TE TYRE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~

          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)... )
          (V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)... )


     RULE RUC4: REVIEW A CORNER OF MODEL.

GOAL-IS: RUC
   37,0       STM: (GOL     O65(NUMS FIVE DIM TWO TYPE OBJECT)(P25 I66 A67~
168 I69 A70 I71 P74 I79 A80 IS1 P84 I89 A90 I91 P108 I115 A116 I117)     )
          (V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110)     )
          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYRE VERTEX)(P84 X~
85 A88 X87 A86)     )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYRE VERTEX)... )
          (V24(CR X30 PNUM P25 VSREC (RL UL) SPEC TE TYPE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYRE SIDE)... )
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYRE OBJECT)... )
          (V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYRE VERTEX)... )


     RULE RUC1: POSSIBLE OVERLAY IN COMPLETED OBJECT.

GOAL-IS: SOOC
   38,0       STM: (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)~
(P25 X26 A31 X30 A29 X28 A27)     )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P39 P25 P42 P49 E38 I40~
141 I44 I45 E47 A126 A124 X125)     )
          (GDL     O65(OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TYPE~
OBJECT)(R25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 P108 I1~


15 A116 I117)     )
          (V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VEPTEX)... ~

          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)... )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)... )
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)... )
          (V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)... )
```

ACT #1: AA-SYS

RULE S00C1: START OVERLAIN OBJECT CONFIRMATION

ACT #130: VI-SYS

RULE VI7: ONLY EXP SPECIFIED.

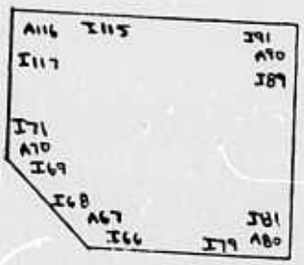
DIR IS DR

RAN IS NIL

EXP IS (TE (RL UL))

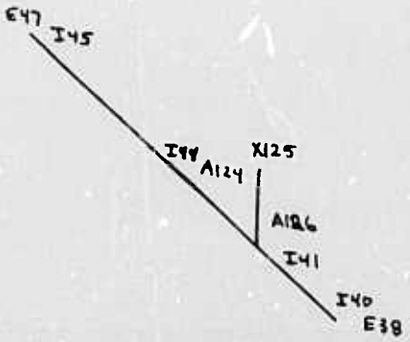
ATT IS NIL

VI IS NIL



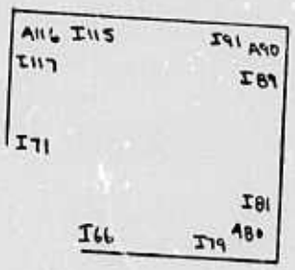
065 (f)

(32,0)



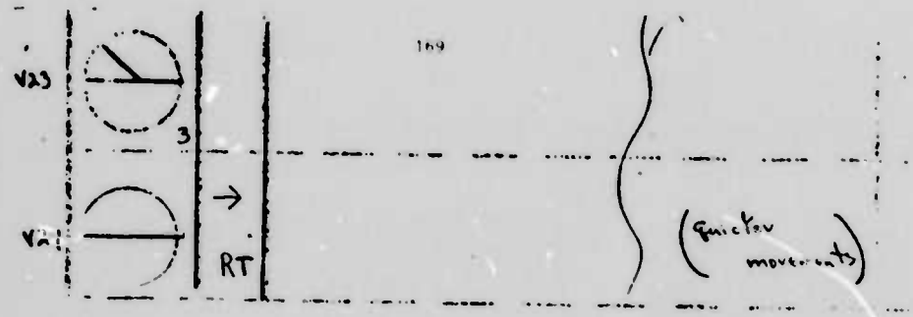
L37 (c)

(32,0)



065 (g)

(38,0)



AT VERTEX VER3.

DIR IS DR

RAN IS SH

EXP IS YES

ATT IS NIL

VI IS (V131 P132 X133 A138 X137 A136 X135 A134)

GOAL-IS: 00C
40.0 STM: (GOL 065(OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM T~
WO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 ~
P108 I115 A116 I117))
(V24(CR X30 PNUM P25 VSPEC (RL UD) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 I40~
I41 I44 I45 E47 A126 A124 X125))
(V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~
)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE))
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

ACT #1: AA-SYS.

RULE 00C1: VERTEX AS EXPECTED ON OVERLAYING LINE.

ACT #139: V1-SYS.

RULE V19: EXP & ATT & NO STRAIGHT SIDES FOUND.

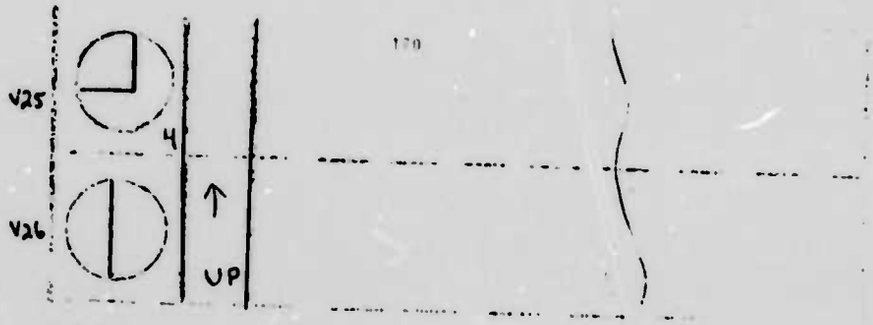
DIR IS RT

RAN IS NIL

EXP IS RTA

ATT IS UP

V1 IS NIL



AT VERTEX VER4

DIR IS RT

RAN IS ME

EXP IS YES

ATT IS UP

VI IS (VI 5O P141 X142 A145 X144 A143)

GOAL IS: K2C

42.0 STM (GOL O65)OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM T~
WO TYPE OBJECT)XP25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 ~
P108 I115 A116 I117))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)XP25 X2~
6 A31 X30 A29 X28 A27))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDEXP49 P25 P42 P49 E38 I40~
I41 I44 I45 E47 A126 A124 X125))
(V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~

(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

ACT #1: AA-SYS

RULE K2C11: EXPECTED ANGLE.

ACT #146: VI-SYS

RULE VI9: EXP & ATT & NO STRAIGHT SIDES FOUND.

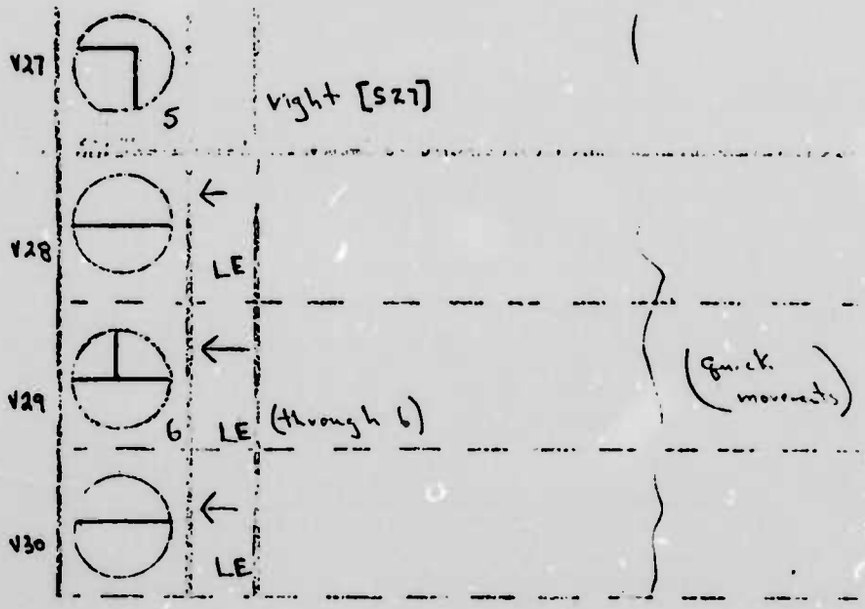
DIR IS UP

RAN IS NIL

EXP IS RTA

ATT IS LE

VI IS NIL



AT VERTEX VER5

DIR IS UP

RAN IS ME

EXP IS YES

ATT IS LE

VI IS (V147 P148 X149 A152 X151 A150)

GOAL-IS: K2C
44,0 STM: (GOL O65(OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM T~
WO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 ~
P108 I115 A116 I117))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 I40~
I41 I44 I45 E47 A126 A124 X125))
(V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~
)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX))
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE))
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT))
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX))

ACT #1: AA-SYS

RULE K2C11: EXPECTED ANGLE

ACT #153: VI-SYS

RULE V18: ATT & EXP SPECIFIED AND STRAIGHT ATT SIDE.

DIR IS LE

RAN IS NIL

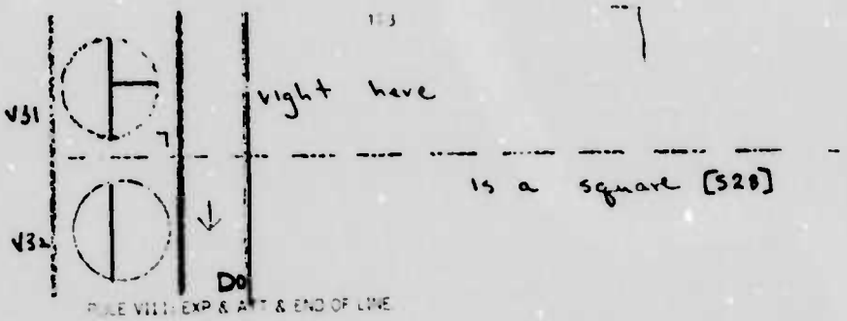
EXP IS RTA

ATT IS DO

VI IS NIL

AT VERTEX VER6

MOVE THROUGH VER6.



RULE V111: EXP & ATT & END OF LINE

AT VERTEX VER?

DIR IS LE

RAN IS LO

EXP IS CON

ATT IS DO

VI IS (L154 P159 P166 E155 I157 I158 I160 I161 I156 I162 I163 E164 V165 P166~
X167 A172 X171 A170 X169 A168)

GOAL-IS: K2C
47,0 STM: (GOL 065(OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM T~
WO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 ~
P108 I115 A116 I117))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 I40~
I41 I44 I45 E47 A126 A124 X125))
(V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~
)
(V83(CR X87 PNUM P84 VSPEC (RTA UP) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

ACT #1: AA-SYS

RULE K2C8: EXPECTED ANGLE WITH SIDE AND VERTEX.

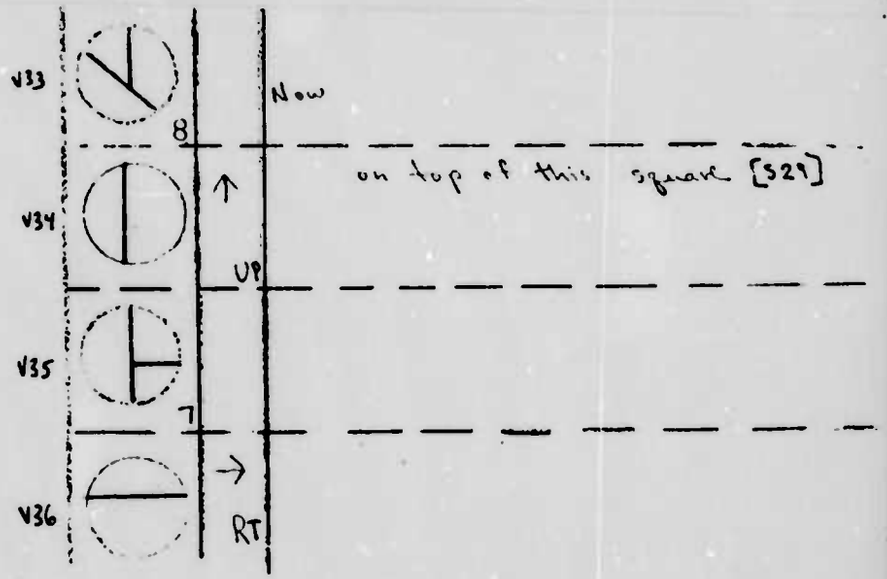
ACT #173: VI-SYS

RULE V19: EXP & ATT & NO STRAIGHT SIDES FOUND

DIR IS DO

RAN IS NIL

EXP IS OBA



AT VERTEX VER8

DIR IS DO

RAN IS SH

EXP IS CON

ATT IS RT

VI IS (V174 P175 X176 A181 X180 A179 X178 A177)

GOAL-IS: K2C
49,0 STM: (GOL 065(OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM T~
WO TYPE OBJECT)XP25 166 A67 168 169 A70 171 P74 179 A80 181 P84 189 A90 191 ~
P108 1115 A116 1117))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEXXP25 X2~
6 A31 X30 A29 X28 A27))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDEXP49 P25 P42 P49 E38 140~
141 144 145 E47 A126 A124 X125))
(V107(CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)... ~
)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

ACT #1: AA-SYS.

RULE K2C3: COMPLETE OVERLAY OB.' CONFIRMA.ION.

WO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 ~
P108 I115 A116 I117))
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X2~
6 A31 X30 A29 X28 A27))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 I40~
I41 I44 I45 E47 A126 A124 X125))
(V107(CR X117 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX) ~
)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)...)
(V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

ACT #182: INC-SYS.

RULE 102: INCORPORATE ANOTHER OBJECT OVERLAIN.

51,0 ITM: O10(V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJECT)
V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
L37(CR X125 VSPEC DIAGONAL TYPE SIDE)
V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)

51,0 ITM: O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJE~
CT)
V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
L37(CR X125 VSPEC DIAGONAL TYPE SIDE)
V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)
O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TYP~
E OBJECT)
S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)
V107(CR X109 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)

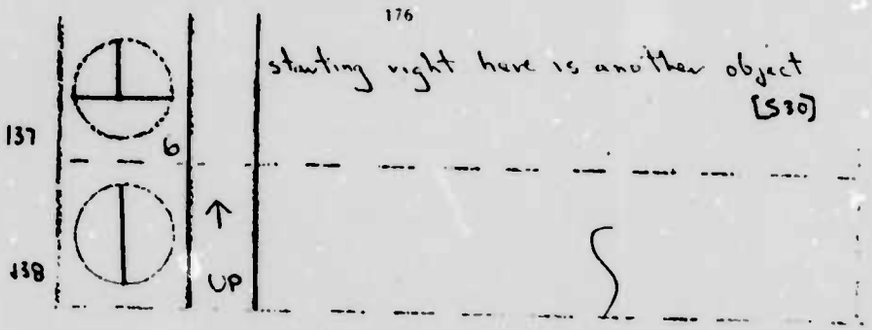
GOAL-IS: SNO
51,0 STM: (GOL)
(V107(CR X109 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110))
(LAST S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I10~
2 I104 P94 I104 A98 X97 A96 I105 P108 I118 E119))
(O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)...)

ACT #1: AA-SYS.

RULE SNOO: START NEW OBJECT AT UNLINKED POSITION.

WILL START NEW OBJECT AT RSH ORI.

DIRECTION IS UP



AT VERTEX VER6

GOAL-IS: RNO
52,0 STM: (GOL
(LAST S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I10~
2 I104 P94 I104 A98 X97 A96 I105 P105 I118 E119))
(V107(CR X109 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110))
(O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)

(V83(CR X87 PNUM P84 VSPEC (RTA LR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)...)

ACT #183: REC-SYS

RULE REC0: BEGIN RECOGNITION OF NEW OBJECT

GOAL-IS: RNO
53,0 STM: (GOL O184(DIM TWO NUMS ONE TYPE OBJECT)(P94 I185 A1~
86 I187))
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I102 I104 P~
94 I104 A98 X97 A96 I105 P108 I118 E119))
(V107(CR X109 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110))
(O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V83(CR X87 PNUM P84 VSPEC (RTA UP) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)...)

RULE REC11: ENTER OBJECT FROM SIDE.

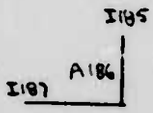
```
GOAL-IS: RNO
    54,0      STM: (GOL    0184:DIM TWO NUMS ONE TYPE OBJECT)(P94 I185 A1~
86 I187)    )
          (O65)(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 P108 ~
I115 A116 I117)    )
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I102 I104 P~
94 I104 A98 X97 A96 I105 R108 I118 E119)    )
          (V107(CR X109 PNUM P108 VSREC (UD RT) SPEC TE TYPE VERTEX)... ~
)
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (V83(CR X87 PNUM P84 VSREC (RTA UR) SPEC V2 TYPE VERTEX)... )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)... )
          (O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)... )
```

RULE REC3: ENTER VERTEX BY ANGLE.

```
GOAL-IS: RNO
    56,0      STM: (GOL    0184:DIM TWO NUMS ONE TYPE OBJECT)(P94 I185 A1~
86 I187 P108 I188 A189 I190)    )
          (CON    V107(CR X113 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VER~
TEX) P108 X109 A114 X113 A112 X111 A110)    )
          (O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 P108 ~
I115 A116 I117)    )
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (V83(CR X87 PNUM P84 VSREC (RTA UR) SPEC V2 TYPE VERTEX)... )
          (V73(CR X77 PNUM P74 VSREC (RTA DR) SPEC V2 TYPE VERTEX)... )
          (O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)... )
```

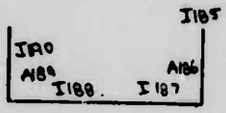
RULE REC1: NO MORE MEMORY INFORMATION

```
GOAL-IS: S*02
    56,0      STM: (GOL    0184(NAME SQUARE-OR-RECTANGLE DIM TWO TYPE OBJ~
ECT)(P94 I185 A186 I187 P108 I188 A189 I190 I191 A192 I193 I194 A195 I196)  ~
  )
          (V107(CR X113 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110)    )
          (O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)(R25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 R108 ~
I115 A116 I117)    )
          (S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)... )
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)... )
          (V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)... )
          (O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)... )
```



0184 (a)

(53,0)



0184 (b)

(55,0)

0184 (c)

(56,0)

ACT #1: AA-SYS

RULE SK021: START LOOKING FOR KNOWN OBJECT INFO.

ACT #197: VI-SYS

RULE V19: EXP & ATT & TWO STRAIGHT SIDES FOUND

DIR IS UP

PAN IS NIL

EXP IS RTA

ATT IS LE

VI IS NIL

AT VERTEX VER9

DIR IS UP

EXP IS YES

ATT IS LE

VI IS (V198 P199 X200 A203 X202 A201)

GOAL-IS: KO2
P8,0 STM: (GOL O184(NAME SQUARE OR-RECTANGLE DIM TWO TYPE OBJ~
ECT)(P94 I185 A186 I187 P108 I188 A189 I190 I191 A192 I193 I194 A195 I196) ~
)
(V107(CR X113 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110))
(O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 P108 ~
I115 A116 I117))
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE))
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(O10(NEXT-OB 065 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)...)

ACT •1: AA-SYS

RULE KO211: EXPECTED ANGLE IS THERE

ACT •204: VI-SYS

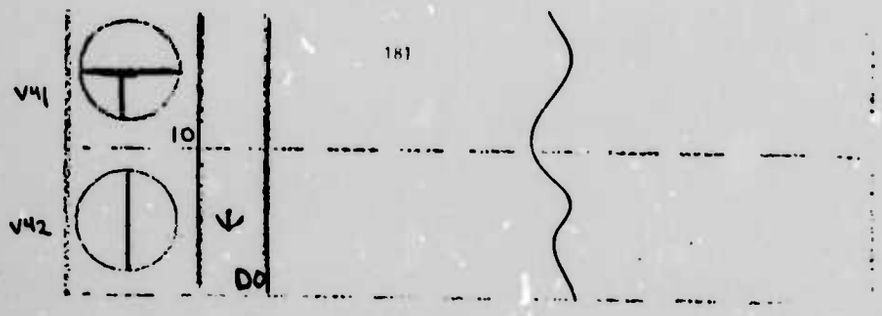
RULE VI9: EXP & ATT & NO STRAIGHT SIDES FOUND.

DIR IS LE

RAN IS NIL

EXP IS RTA

ATT IS DO



AT VERTEX VER10.

DIR IS LE

RAN IS SH

EXP IS CON

ATT IS DO

VI IS (V205 P206 X207 A212 X211 A210 X209 A208)

GOAL-IS: KO2

60,0 STM: (GOL 0184(NAME SQUARE-OR-RECTANGLE DIM TWO TYPE OBJ~
ECT)(P94 I185 A186 I187 P108 I188 A189 I190 I191 A192 I193 I194 A195 I196 P1~
99))
(V107(CR X113 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)XP10~
8 X109 A114 X113 A112 X111 A110))
(065(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 P108 ~
I115 A116 I117))
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX) .)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)
(O10(NEXT-OB 065 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OB~
JECT)...)

ACT #1: AA-SYS.

RULE KO29: EXP IS PART OF VERTEX.

ACT #213: VI-SYS.

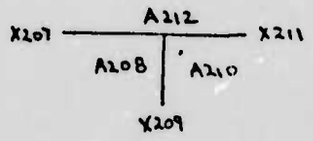
RULE VI9: EXP & ATT & NO STRAIGHT SIDES FOUND.

DIR IS DO

RAN IS NIL

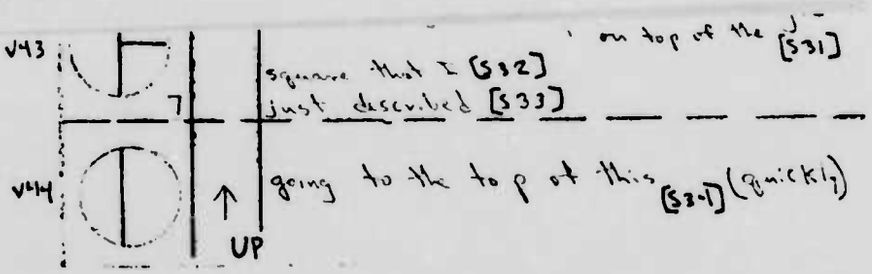
EXP IS RTA

ATT IS RT



V205

(62,0)



AT VERTEX VER7.

DIR IS DO

PATH IS LO

EXP IS CON

ATT IS RT

V1 IS (V214 P215 X216 A221 X220 A219 X218 A217)

GOAL-IS: K02
K2,0 STM: (V205(CR X211 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERT~
EX)P206 X207 A212 X211 A210 X209 A208))
(GOL O184(NAME SQUARE-OR-RECTANGLE DIM TWO TYPE OBJECT)(P9~
4 I185 A186 I187 P108 I188 A189 I190 I191 A192 I193 I194 A195 I196 P199 P206~
))
(V107(CR X113 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110))
(O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)...)
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)

ACT #1: AA-SYS

RULE K027: GOAL COMPLETED.

GOAL-IS: I2D
63,(STM: (GOL O184(NAME SQUARE-OR-RECTANGLE DIM TWO TYPE OBJ~
ECT)(P94 I185 A186 I187 P108 I188 A189 I190 I191 A192 I193 I194 A195 I196 P1~
99 P206))
(V205(CR X211 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)(P20~
6 X207 A212 X211 A210 X209 A208))
(V107(CR X113 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)(P10~
8 X109 A114 X113 A112 X111 A110))
(O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TY~
PE OBJECT)...)
(S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
(V73(CR X77 PNUM P74 VSPEC (RTA DR) SPEC V2 TYPE VERTEX)...)

ACT #222: INC-SYS.

RULE I22: INCORPORATE ANOTHER OBJECT.

64,0 ITM: O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJE~
CT)
V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
L37(CR X125 VSPEC DIAGONAL TYPE SIDE)
V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)
O65(V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TYP~
E OBJECT)
S101(CR E119 VSPEC HORIZONTAL TYPE SIDE)
V107(CR X113 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VERTEX)

64,0 ITM: O10(NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJE~
CT)
V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
L37(CR X125 VSPEC DIAGONAL TYPE SIDE)
V48(CR X50 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)
O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGL~
E DIM TWO TYPE OBJECT)
S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)
V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VER~
TEX)
O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)

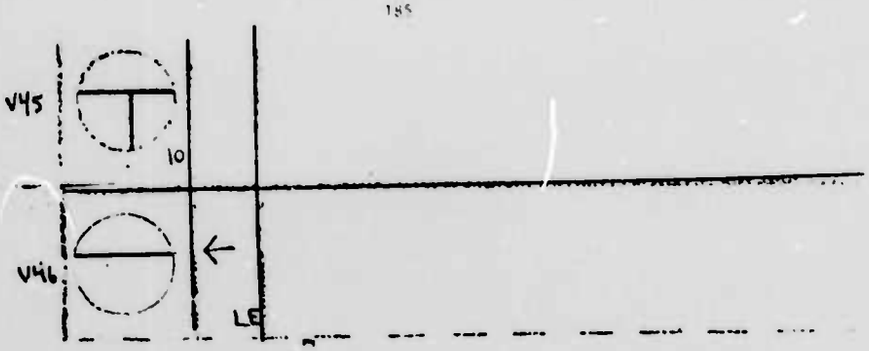
GOAL-IS: SNO
64,0 STM: (GOL)
(LAST V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VE~
RTEX)(P206 X207 A212 X211 A210 X209 A208))
(S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I102 I104 P9~
4 I104 A98 X97 A96 I105 P108 I118 E119))
(V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)...)
(O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT).~
..)
(O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)
(V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)

ACT #1: AA-SYS.

RULE SN00: START NEW OBJECT AT UNLINKED POSITION.

WILL START NEW OBJECT AT ORIGIN.

DIRECTION IS LE



AT VERTEX VER10.

```
GOAL-IS: RNO
    65,0       STM: (GOL     )
               (LAST     V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VE~
RTEX) (P206 X207 A212 X211 A210 X209 A208)     )
               (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE) P84 E103 I102 I104 P9~
4 I104 A98 X97 A96 I105 P108 I118 E119)     )
               (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)...)
               (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
...)
               (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)
               (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
               (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
               (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)


     ACT *223: REC-SYS

     RULE RECO: BEGIN RECOGNITION OF NEW OBJECT.

GOAL-IS: RNO
    66,0       STM: (GOL     0224(DIM TWO NUMS ONE TYPE OBJECT)(P206 I225 A~
226 I227)     )
               (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)(P20~
6 X207 A212 X211 A210 X209 A208)     )
               (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I102 I104 P9~
4 I104 A98 X97 A96 I105 P108 I118 E119)     )
               (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)...)
               (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
...)
               (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)
               (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)...)
               (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
               (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)...)
```

RULE REC12: ENTER OBJECT AT AN ANGLE

```
GOAL-IS: RNO
    67,0      STM: (GOL     O224(DIM TWO NUMS ONE TYPE OBJECT)(P206 I225 A~
226 I227)    )
          (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT)(~
P94 I185 A186 I187 P108 I188 A189 I190 I191 A192 I193 I194 A195 I196 P198 P2~
06)    )
          (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)(P20~
6 X207 A210 X211 A210 X209 A208    )
          (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)... )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)... )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)... )
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (V83(CR X87 PNUM P84 VSPEC (RTA UR) SPEC V2 TYPE VERTEX)... )
```

RULE REC3: ENTER VERTEX BY ANGLE.

```
GOAL-IS: RNO
    68,0      STM: (S228(CR I232 VSPEC VERTICAL TYPE SIDE)(P206 E230 I229 ~
I231 P108 I231 A112 X111 A110 I232)    )
          (GOL     O224(DIM TWO NUMS ONE TYPE OBJECT)(P206 I2.5 A226 I22~
7)    )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)(P108 X109 A114 X111 A110)    )
          (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT)~
... )
          (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)... ~
)
          (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)... )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)... )
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
```

RULE REC12: ENTER OBJECT AT AN ANGLE.

```
GOAL-IS: RNO
    69,0      STM: (S228(CR I232 VSPEC VERTICAL TYPE SIDE)(P206 E230 I229 ~
I231 P108 I231 A112 X111 A110 I232)    )
          (GOL     O224(DIM TWO NUMS ONE TYPE OBJECT)(P206 I225 A226 I22~
7)    )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 ~
A90 I91 P108 I115 A116 I117)    )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)... )
          (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT)~
... )
          (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)... ~
)
          (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)... )
          (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
```

RULE REC7: ENTER SIDE AT AN XIT

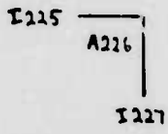
```
GOAL-IS: RNO
    70,0       STM: (S228(CR E237 VSPEC VERTICAL TYPE SIDEXP206 E230 I229 ~
I231 P108 I231 A112 X111 A110 I232 P215 I236 E237)    )
           (GOL     O224(DIM TWO NUMS ONE TYPE OBJECTXP206 I225 A226 I22~
7 P122 I233 A234 I235)    )
           (L37(CR X125 VSPEC DIAGONAL TYPE SIDEXP49 R25 P42 P49 E38 I40~
 141 I44 I45 E47 A126 A124 X125)    )
           (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)    )
           (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)    )
           (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
    )
           (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)    ~
)
           (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)    )
           (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)    )
```

RULE REC15: LOOK IN ITM FOR NEEDED MEMORY

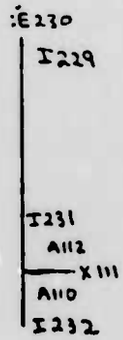
```
GOAL-IS: RNO
    71,0       STM: (GOL     O224(DIM TWO NUMS ONE TYPE OBJECTXP206 I225 A~
226 I227 P122 I233 A234 I235)    )
           (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECTXP4 I11 A12 I13 I14 A15 I16 P25 I33 A34 I35 P49)    )
           (S228(CR E237 VSPEC VERTICAL TYPE SIDEXP206 E230 I229 I231 P1~
08 I231 A112 X111 A110 I232 P215 I236 E237)    )
           (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)    )
           (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)    )
           (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)    )
           (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
    )
           (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)    ~
)
           (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)    )
```

RULE REC11: ENTER OBJECT FROM SIDE

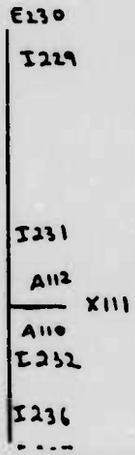
```
GOAL-IS: RNO
    72,0       STM: (GOL     O224(DIM TWO NUMS ONE TYPE OBJECTXP206 I225 A~
226 I227 P122 I233 A234 I235)    )
           (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECTXP4 I11 A12 I13 I14 A15 I16 P25 I33 A34 I35 P49)    )
           (S228(CR E237 VSPEC VERTICAL TYPE SIDEXP206 E230 I229 I231 P1~
08 I231 A112 X111 A110 I232 P215 I236 E237)    )
           (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)    )
           (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)    )
           (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)    )
           (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
    )
           (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)    ~
)
           (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)    )
```



0224 (a)
(66,0)



S228 (a)
(68,0)



S228 (b)
(70,0)

RULE REC15: LOOK IN ITM FOR NEEDED MEMORY

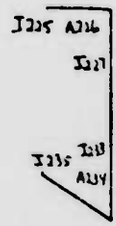
```
GOAL-IS: RNO
    73.0      STM: (GOL     0224(DIM TWO NUMS ONE TYPE OBJECT)(P206 I225 A~
226 I227 P122 I233 A234 I235)    )
          (V48(CR A51 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)(P49 X5~
0 A5) X54 A53 X52 A51)    )
          (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)(P4 I11 A12 I13 I14 A15 I16 P25 I33 A34 I35 P49)    )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDE)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)    )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)    )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)    )
          (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
    )
          (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)    ~
)
```

RULE REC3: ENTER VERTEX BY ANGLE

```
GOAL-IS: RNO
    74.0      STM: (GOL     0224(DIM TWO NUMS ONE TYPE OBJECT)(P206 I225 A~
226 I227 P122 I233 A234 I235 P49 I238 A239 I240)    )
          (COM     V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX~
)(P49 X50 A55 X54 A53 X52 A51)    )
          (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)(P4 I11 A12 I13 I14 A15 I16 P25 I33 A34 I35 P49)    )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDE)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)    )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)    )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)    )
          (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
    )
          (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)    ~
)
```

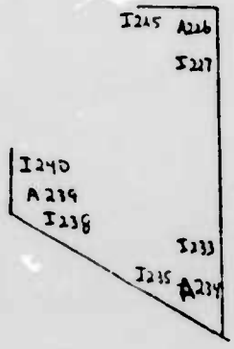
RULE REC1: NO MORE MEMORY INFORMATION

```
GOAL-IS: SUC2
    75.0      STM: (GOL     0224(DIM TWO TYPE OBJECT)(P206 I225 A226 I227 ~
P122 I233 A234 I235 P49 I236 A239 I240)    )
          (COM     V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX~
)(P49 X50 A55 X54 A53 X52 A51)    )
          (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)(P4 I11 A12 I13 I14 A15 I16 P25 I33 A34 I35 P49)    )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDE)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)    )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)    )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)    )
          (O184(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
    )
```



0224 (b)

(70,0)



0224 (c)

(74,0)

ACT •1: AA SYS

RULE SUCCD: START LOOKING FOR UNKNOWN OBJECT INFO

ACT •241: VI-SYS

RULE VI2: ONLY DIR IS SPECIFIED

DIR IS LE

PAN IS NIL

EXP IS NIL

ATT IS NIL

VI IS NIL

AT VERTEX VER11

DIR IS LE

RAY IS ME

EXP IS NIL

ATT IS NIL

V1 IS (V242 P243 X244 A247 A246 A245)

DOA1 IS UO2

(1.0 STM (GOL 0224 DIM TWO TYPE OBJECT NP206 I205 A226 I227 ~
P123 I233 A234 I235 P49 I238 A239 I240))

(.205(OR X201 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX (P20~
6 X207 A212 A211 A210 X209 A208))

(.004 V48(OR X54 PNUM P49 VSPEC (UO DR) SPEC TE TYPE VERTEX~
(P49 A50 A55 X54 A53 A52 A51))

(.010(OR I33 NEXT -08 D.85 V48 A34 V24 A16 NAME TRIANGLE DIM TWO ~
TYPE OBJECT))

(.5228(OR E237 VSPEC VERTICAL TYPE SIDE))

(.371(OR X125 VSPEC DIAGONAL TYPE SIDE))

(.065(NEXT -08 D.84 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT))

(V107(NOMO YES OR X111 PNUM P108 VSPEC (UO RT) SPEC TE TYPE VE~
RTEX))

(0.84(V205 A195 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
)

ACT +1: AA-SYS

RULE U105: MW CORNER

ACT +251: V1-SYS

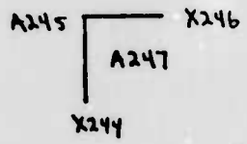
RULE V12: ONLY DIR IS SPECIFIED

DIR IS DD

RAY IS NIL

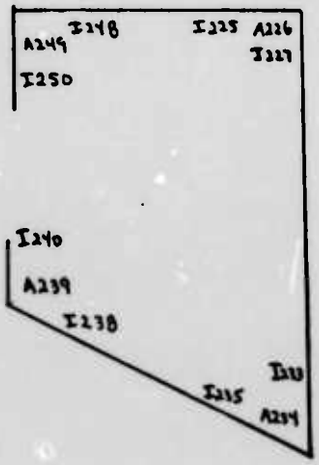
EXP IS NIL

ATT IS NIL



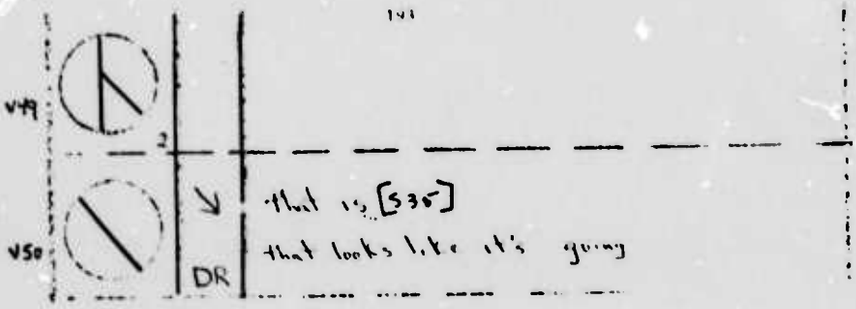
V242

(79,0)



0224 (P)

(79,0)



AT VERTEX VER2

DIR IS DO

RAN IS ME

EXP IS NIL

ATT IS NIL

VI IS (V252 P253 X254 A259 X258 A257 X256 A255)

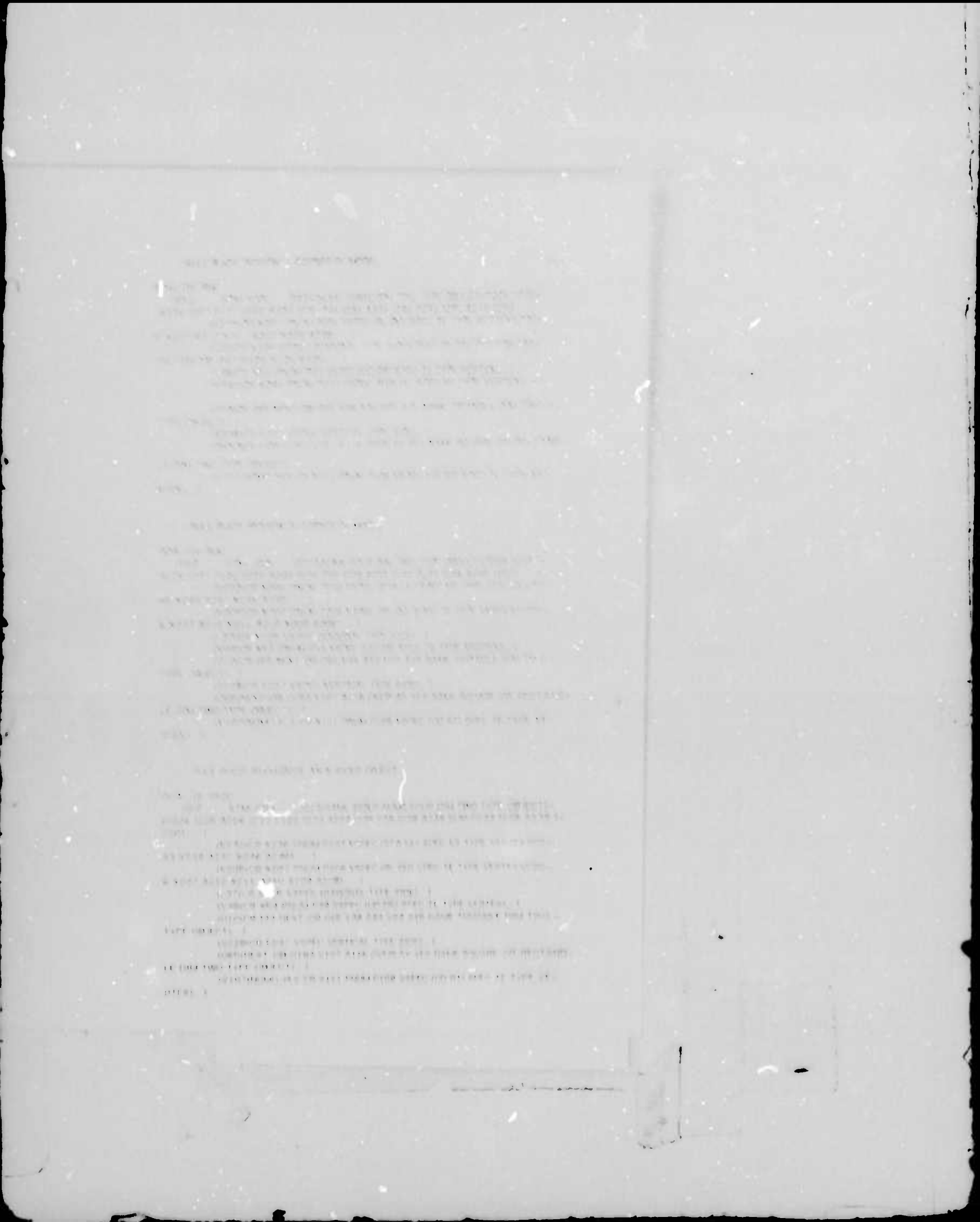
GOAL IS: C12
    '9,0   STM: (V242(CR X246 PNUM P243 VSPEC (RTA DL) SPEC V2 TYPE VER~
TEX)(P243 X244 A247 X246 A245)   )
        (GOL   0224(DIM TWO TYPE OBJECT)(P206 I225 A226 I227 P122 I2~
33 A234 I235 P49 I238 A239 I240 P243 I248 A249 I250)   )
        (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)(P20~
6 X207 A212 X211 A210 X209 A208)   )
        (CGM   V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX~
)   )
        (O10(CR I33 NEXT OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)   )
        (S228(CR E237 VSPEC VERTICAL TYPE SIDE)   )
        (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)   )
        (O65(NEXT OB O184 V107 A116 OVERLAY YES NAME SQUARE OR RECTANG~
LE DIM TWO TYPE OBJECT)   )
        (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)   )

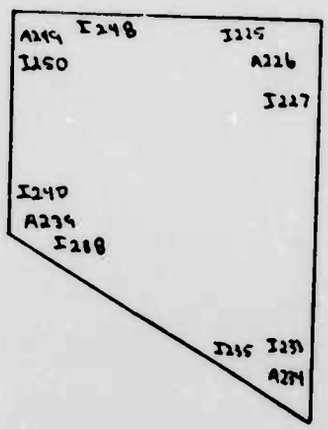
    ACT o1: AA SYS

    RULE U024: OUTLINE COMPLETED

GOAL IS: RUC
    80,0   STM: (GOL   0224(DIM TWO TYPE OBJECT)(P206 I225 A226 I227 ~
P122 I233 A234 I235 P49 I238 A239 I240 P243 I248 A249 I250)   )
        (V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)(P49 X5~
0 A55 X54 A53 X52 A51)   )
        (V242(CR X246 PNUM P243 VSPEC (RTA DL) SPEC V2 TYPE VERTEX)(P2~
43 X244 A247 X246 A245)   )
        (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)   ~
)
        (O10(CR I33 NEXT OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)   )

```
          (S228(CR E237 VSPEC VERTICAL TYPE SIDE)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)... )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)... )


     ACT #260: REC-SYS


     RULE RUC4: REVIEW A CORNER OF MODEL


GOAL-IS: RUC
   81,0      STM: (GOL    0224(NUMS ONE DIM TWO TYPE OBJECT)(P206 I225 A~
226 I227 P122 I233 A234 I235 P49 I236 A239 I240 P243 I248 A249 I250)    )
          (V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)(P49 X5~
0 A55 X54 A53 X52 A51)    )
          (V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)(P2~
43 X244 A247 X246 A245)    )
          (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)... ~
)
          (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)... )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDE)... )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)... )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)... )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)... )


     RULE RUC4: REVIEW A CORNER OF MODEL


GOAL-IS: RUC
   82,0      STM: (GOL    0224(NUMS TWO DIM TWO TYPE OBJECT)(P206 I225 A~
226 I227 P122 I233 A234 I235 P49 I236 A239 I240 P243 I248 A249 I250)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 P42 P49 E38 I40~
I41 I44 I45 E47 A126 A124 X125)    )
          (V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)(P49 X5~
0 A55 X54 A53 X52 A51)    )
          (V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)... ~
)
          (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)... ~
)
          (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)... )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDE)... )
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)... )
          (V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)... )
```





0224 (e)

(80,0)

ACT #1: AA-SYS

RULE SK2C1: START CONFIRMING OBJECT.

ACT #261: VI-SYS

RULE VI9: EXP & ATT & NO STRAIGHT SIDES FOUND.

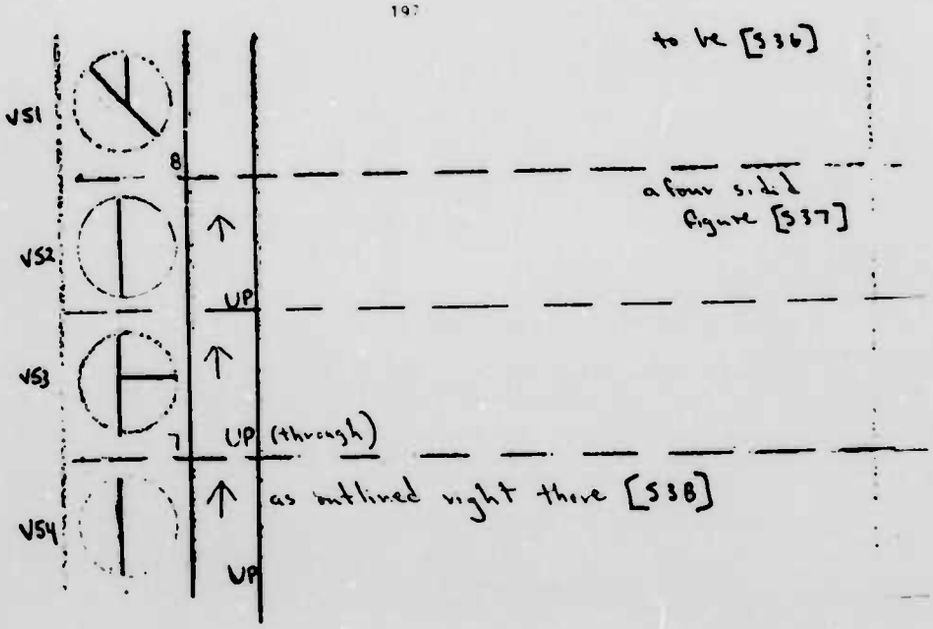
DIR IS DR

RAN IS NIL

EXP IS ACA

ATT IS UR

VI IS NIL



VERTEX VER8.

DIR IS DR

RAN IS LO

EXP IS CON

ATT IS UR

VI IS (V262 P263 X264 A269 X268 A267 X266 A265)

GOAL IS K2C
87,0 STM: (GOL O224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)~
(P206 I225 A226 I227 P122 I233 A234 I235 P49 I238 A239 I240 P243 I248 A249 I~
250))
(V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEXXP2~
43 X244 A247 X246 A245))
(V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEXXP20~
6 X207 A212 X211 A210 X209 A208))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)
(O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)...)
(S228(CR E237 VSPEC VERTICAL TYPE SIDE)...)
(O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)
(V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)...)

ACT #1 AA-SYS

RULE #2CW EXPECTED ANGLE WITH VERTEX

ACT #2TO VI-SYS

RULE VIB ATT & EXP SPECIFIED AND STRAIGHT ATT SIDE

DIR IS UP

RAY IS NIL

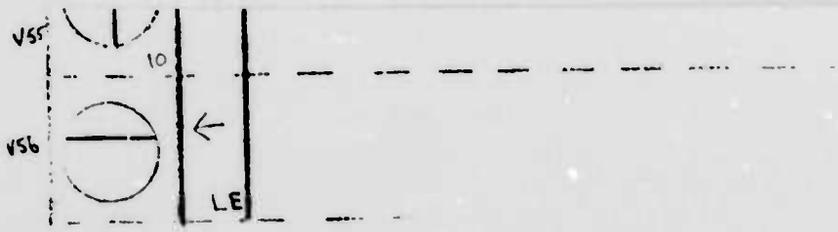
EXP IS RTA

ATT IS LE

VI IS NIL

AT VERTEX VER?

MOVE THROUGH VER?



RULE V11: EXP & ATT & END OF LINE

AT VERTEX VER10

DIR IS UP

RAN IS LS

EXP IS CON

ATT IS LE

V1 IS (L271 P276 P283 E272 I274 I275 Q277 I276 I273 I279 I280 E281 V282 P283~
X284 A289 X288 A287 X286 A285)

GOAL IS X2C
90,0 STM (GOL 0224 NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)~
(P206 I225 A226 I227 P122 I233 A234 I235 P49 I238 A239 I240 P243 I246 A249 I~
250))
(V242(OR X246 PNUM P243 VSPEC (RTA UU) SPEC V2 TYPE VERTEX)(P2~
43 X244 A247 X248 A245))
(V205(OR X207 PNUM P205 VSPEC (RL DD) SPEC TE TYPE VERTEX)(P20~
6 X207 A212 X211 A210 X209 A208))
(L37(OR X125 VSPEC DIAGONAL TYPE SIDE))
(V48(OR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX))
(O1(OR I33 NEXT-OB 065 V46 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT))
(S229(OR E237 VSPEC VERTICAL TYPE SIDE))
(O65(NEXT-OB 0184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT))
(V107(NOMO YES OR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX))

ACT •1: AA SYS

RULE X208: EXPECTED ANGLE WITH SIDE AND VERTEX

ACT •290: V1 SYS

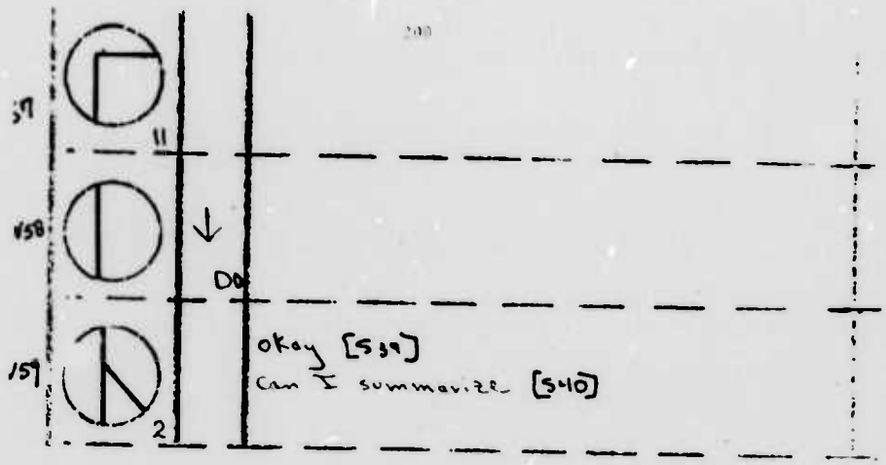
RULE V19: EXP & ATT & NO STRAIGHT SIDES FOUND

DIR IS LE

RAN IS NIL

EXP IS RTA

ATT IS DO



AT VERTEX VER11

DIR IS LE

RTN IS ME

EXP IS YES

ATT IS DO

VI IS (V291 P292 X293 A296 X295 A294)

GOAL IS: K2C

92,0 STM (GOL 0224(NAME SIDED NUMS FOUR LIM TWO TYPE OBJECT)~
(P206 I225 A226 I227 P122 I233 A234 I235 P49 I238 A239 I240 P243 I248 A249 I~
250))

(V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)(P2~
43 X244 A247 X246 A245))

(V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)(P20~
6 X207 A212 X211 A210 X208 A208))

(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)

(V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)

(O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT))

(S228(CR E237 VSPEC VERTICAL TYPE SIDE)...)

(O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)

(V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)...)

ACT #1: AA-SYS.

RULE K2C11: EXPECTED ANGLE

...T x297 V1-SYS

RULE V19: EXP & ATT ... NO STRAIGHT SIDES FOUND

DIR IS DO

RAN IS NIL

EXP IS OBA

ATT IS RT

V1 IS NIL

AT VERTEX VER2.

DIR IS DO

RAN IS ME

EXP IS CON

ATT IS RT

V1 IS (V298 P299 X300 A305 X304 A303 X302 A301)

GOAL-IS: K2C
94.0 STM: (GOL 0224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)~
(P206 I225 A226 I227 P122 I233 A234 I235 P49 I238 A239 I240 P243 I248 A249 I~
250))
(V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)(P2~
43 X244 A247 X246 A245))
(V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)(P20~
6 A207 A212 X211 A210 X209 A208))
(L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
(V48(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)...)
(O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)...)
(S228(CR E237 VSPEC VERTICAL TYPE SIDE)...)
(O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)
(V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX)...)

ACT #1 AA SYS

RULE #309 COMPLETE CONFIRM WITH VERTEX

95,0 STM 010(CR I33 NEXT-OB 0224 NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT) ~
(P205 I225 A226 I227 P102 I233 A234 I236 P49 I238 A239 I240 P243 I246 ~
P206)
V243(CR X240 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX(P2~
43 X207 A247 X246 A249))
V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX(P20~
6 X207 A213 X211 A217 X209 A205))
I137(CR X125 VSPEC DIAGONAL TYPE SIDE))
V49(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX( )
I0184(CR I33 NEXT-OB 065 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT))
S229(CR E237 VSPEC VERTICAL TYPE SIDE))
065(NEXT-OB 0184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT))
V107(NOMO YES OR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VE~
RTEX))

ACT #306 INC-SYS

95,0 ITM 010(CR I33 NEXT-OB 065 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TY~
PE OBJECT)
V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
I37(CR X125 VSPEC DIAGONAL TYPE SIDE)
V49(CR X54 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)
065(NEXT-OB 0184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGL~
E DIM TWO TYPE OBJECT)
S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)
V107(NOMO YES OR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VER~
TEX)
0184(V205 A198 V107 A189 NAME RECTANGLE DIM TWO TYPE OBJECT) ~
V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)

96,0 ITM 010(CR I33 NEXT-OB 065 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TY~
PE OBJECT)
V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
I37(CR X125 VSPEC DIAGONAL TYPE SIDE)
V48(NOMO YES OR X52 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX~
)
065(NEXT-OB 0184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGL~
E DIM TWO TYPE OBJECT)
S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)
V107(NOMO YES OR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VER~
TEX)
0184(NEXT-OB 0224 V205 A195 V107 A189 NAME RECTANGLE DIM TWO T~
YPE OBJECT)
V205(NOMO YES OR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VER~
TEX)
0224(V205 A226 V48 A239 NAME SIDED NUMS FOUR DIM TWO TYPE OBJE~
CT)
S229(CR E237 VSPEC VERTICAL TYPE SIDE)

```
GOAL-IS: SNO
    96,0      STM: (GOL     )
          (V205(NOMO YES CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VE~
RTEX)(P206 X207 A212 X211 A210 X209 A208)     )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDEXP206 E230 I229 I231 P1~
08 I231 A112 X111 A110 I232 P215 I236 E237)     )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
          (V48(NOMO YES CR X52 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTE~
X)...)
          (O224(V205 A226 V48 A239 NAME SIDED NUMS FOUR DIM TWO TYPE OBJ~
ECT)...)
          (V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)...~
)
          (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)...)
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)

     ACT #1: AA-SYS

     RULE SNO000: NO MORE OBJECTS IN PICTURE

GOAL-IS: NOMO
    97,0      STM: (GOL     )
          (V205(NOMO YES CR X2.. PNUM P206 VSPEC (RL DO) SPEC TE TYPE VE~
RTEX)(P206 X207 A212 X211 A210 X209 A208)     )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDEXP206 E230 I229 I231 P1~
08 I231 A112 X111 A110 I232 P215 I236 E237)     )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)...)
          (V48(NOMO YES CR X52 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTE~
X)...)
          (O224(V205 A226 V48 A239 NAME SIDED NUMS FOUR DIM TWO TYPE OBJ~
ECT)...)
          (V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)...~
)
          (O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO ~
TYPE OBJECT)...)
          (O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANG~
LE DIM TWO TYPE OBJECT)...)

     ACT #307: INC-SYS

     RULE INC0: LAST INCORPORATE ELIMINATE TE VERTICES

98,0   ITM: O10(CR I33 NEXT-OB O65 V48 A34 V24 A15 NAME TRIANGLE DIM TWO TY~
PE OBJECT)
          V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
          L37(CR X125 VSPEC DIAGONAL TYPE SIDE)
          V48(NOMO YES CR X52 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX~
)
          O65(NEXT-OB O184 V107 A116 OVERLAY YES NAME SQUARE-OR-RECTANGL~
E DIM TWO TYPE OBJECT)
          S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)
          V107(NOMO YES CR X111 PNUM P108 VSPEC (UD RT) SPEC TE TYPE VER~
TEX)
          O184(NEXT-OB O224 V205 A195 V107 A189 NAME RECTANGLE DIM TWO T~
YPE OBJECT)
          V205(NOMO YES CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VER~
TEX)
          O224(V205 A226 V48 A239 NAME SIDED NUMS FOUR DIM TWO TYPE OBJE~
CT)
          S228(CR E237 VSPEC VERTICAL TYPE SIDE)
```

okay
um
I have a three sided triangle
which intersects a square on the right
there is a rectangle
on top of the
square on the right um
this rectangle um
has one side
that is the same as the square
that's on the left of the square
and
then the rectangle
goes to the right
and
comes down
and intersects
the square um
on top of the square
and then coming off this rectangle is a four-sided figure
which pulls the whole drawing together
the four-sided figure has sides
on the rectangle
the triangle
and the square

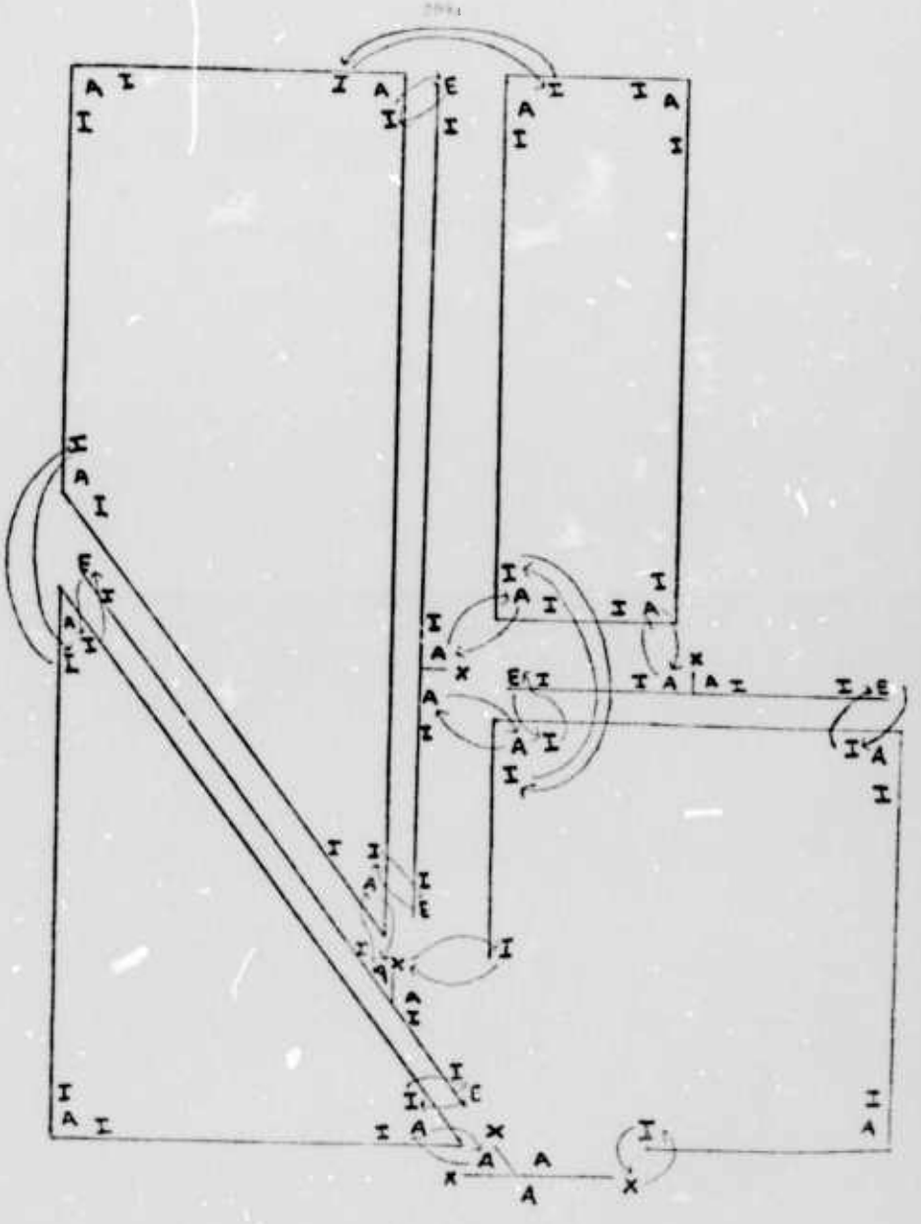
```
98.0    ITM: 010(CR I33 NEXT-OB 065 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJEC~
T)
          V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
          L37(CR X125 VSPEC DIAGONAL TYPE SIDE)
          065(NEXT-OB 0184 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO ~
TYPE OBJECT)
          S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)
          0184(NEXT-OB 0224 NAME RECTANGLE DIM TWO TYPE OBJECT)
          0224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)
          S228(CR E237 VSPEC VERTICAL TYPE SIDE)


GOAL IS: NOMO
    98.0      STM: (GOL    )
          (V105(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX)P20~
6 X207 A212 X211 A210 X209 A208)    )
          (S228(CR E237 VSPEC VERTICAL TYPE SIDE)P206 E230 I229 I231 P1~
08 I231 A112 X111 A110 I232 P235 I236 E237)    )
          (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)    )
          (V48(CR X52 PNUM P49 VSPEC (UO DR) SPEC TE TYPE VERTEX)    )
          (0224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)    )
          (V242(CR X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)    ~
)
          (010(CR I33 NEXT-OB 065 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJ~
ECT    )
          (065(NEXT-OB 0184 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO~
TYPE OBJECT)    )

     ACT #1: AA-SYS

     RULE NOMO1: THATS IT.


NOW THERE IS A A TRIANGLE
AND THEN AN OVERLAIN SQUARE-OR-RECTANGLE
AND THEN A RECTANGLE
AND THEN A FOUR SIDED OBJECT


99.0    ITM: 010(CR I33 NEXT-OB 065 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJEC~
T)
          V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)
          L37(CR X125 VSPEC DIAGONAL TYPE SIDE)
          065(NEXT-OB 0184 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO ~
TYPE OBJECT)
          S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)
          0184(NEXT-OB 0224 NAME RECTANGLE DIM TWO TYPE OBJECT)
          0224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)
          S228(CR E237 VSPEC VERTICAL TYPE SIDE)
```

```
   (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX)(P25 X26 A31 X30-
A29 X28 A27))
   (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)(P49 P25 I42 P49 E38 I40 I41 Q43 X-
I44 I45 E47))
   (O65(NEXT-OB O184 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO TYPE OBJ-
ECT)(P25 I66 A67 I68 I69 A70 I71 P74 I79 A80 I81 P84 I89 A90 I91 P108 I115 A-
116 I117))
   (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE)(P84 E103 I102 I104 P94 I104 A9-
8 X97 A96 I105 P108 I118 E119))
   (O184(NEXT-OB O224 NAME RECTANGLE DIM TWO TYPE OBJECT)(P94 I185 A186 I1-
87 P108 I188 A189 I190 I191 A192 I193 I194 A195 I196 P199 P206))
   (O224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)(P206 I225 A226 I227 P12-
2 I233 A234 I235 P49 I238 A239 I240 P243 I246 A249 I250))
   (S228(CR I237 VSPEC VERTICAL TYPE SIDE)(P206 E230 I229 I231 P108 I111 A-
112 X111 A110 I232 P215 I236 E237))


   (O10
         (O10(CR I33 NEXT-OB O65 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJ-
ECT))
         (P4(UDP DME LRP LME))
         (I11(LIX I14 MARK YES UP A12 DIV1 UP TYPE INT DIX RT))
         (A12(MARK YES TYPE KIA PNUM P4 ANG RTA RT I11 DIV2 RT UP I13 D-
IV1 UP))
         (I13(RIX LO LIX I35 MARK YES DIX UP RT A12 TYPE INT DIV1 RT))
         (I14(UP A15 DIV1 UP DIX LE TYPE INT LIX I11))
         (A15(DL I14 EAL A27 PNUM P25 LE I14 DIV2 DL ANG ACA UP I16 DIV-
1 UP TYPE KEA))
         (I16(RIX LS ESL E36 LIX I33 DL A15 LE A15 DIV1 DL DIX UL TYPE -
INS))
         (P25(UDP DME LRP RSH))
         (I33(MARK YES RIX LS ESL E37 DL A34 DIV1 DL DIX DR TYPE INS LI-
X I16))
         (A34(EAL A51 PNUM P49 MARK YES RT I33 DIV2 RT ANG ACA DL I35 D-
IV1 DL TYPE KEA))
         (I35(STIC I240 RIX LO MARK YES LIX I13 RT A34 DIV1 RT DIX DO T-
YPE INT))
         (P49(UDP USH LRP LME))
    )

   (V24
         (V24(CR X30 PNUM P25 VSPEC (RL UL) SPEC TE TYPE VERTEX))
         (P25(UDP DME LRP RSH))
         (X26(STX X30 DO A31 DIV2 DO UP A27 DIV1 UP DVX LE TYPE ABX PNU-
M P25))
         (A31(DIV2 DO ANG STA TYPE KIA PNUM P25 DO X26 DIV1 DO))
         (X30(DXL I66 UP A29 DIV2 UP STX X26 DO A31 DIV1 DO DVX RT TYPE-
ABX PNUM P25))
         (A29(EAL A67 UP X28 DIV2 UP ANG OBA TYPE KIA PNUM P25 UR X30 D-
IV1 UR))
         (X28(DL A27 DIV2 DL UR A29 DIV1 UR DVX UL TYPE ABX PNUM P25))
         (A27(EAL A15 DL X26 DIV2 DL ANG ACA TYPE KEA PNUM P25 UP X28 D-
IV1 UP))
    )

   (L37
         (L37(CR X125 VSPEC DIAGONAL TYPE SIDE))
         (P49(UDP USH LRP LME))
         (P25(UDP DME LRP RSH))
```

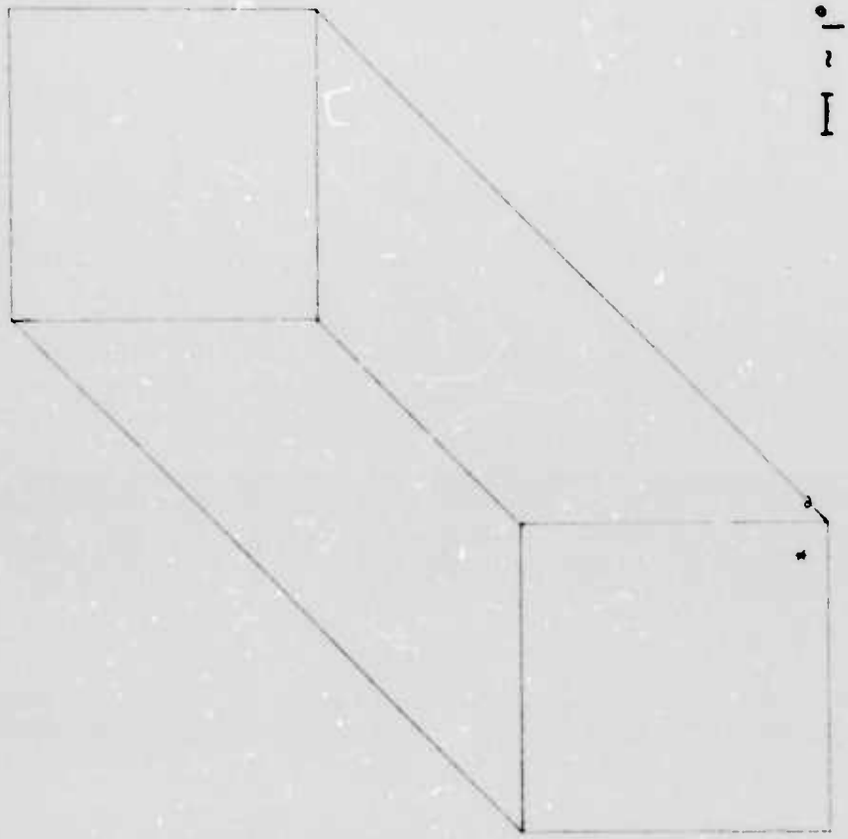
```
        (P42(UDP DSH LRP OR))
        (P44(UDP USH LRP LME))
        (E46(SEL I16 PNUM P39 UR I40 LST UR TYPE SID))
        (I40(LIX I41 RIX SH DIX UL TYPE ILE LEL E03))
        (I41(UP A126 DIV1 UR TYPE INT DIX DR RIX SH LIX I40))
        (I43(OAL I71 LP A124 DIV2 LE RT A126 DIV1 RT DVX UP TYPE KDX P~
NUM P122))
        (I44(LIX I45 RIX LO DIX UL UR A124 DIV1 UR))
        (I45(TYPE ILE LEL E47 RIX LO DIX DR LIX I44))
        (E47(SEL I39 PNUM P28 UR I46 TYPE SID LST UR))
    )

    (O65
        (O65(NEXT-OB O184 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO~
TYPE OBJECT))
        (P28(UDP DME LRP RSH))
        (I66(OCL A30 LIX I79 RIX ME UP A67 DIV1 UP TYPE IOC DIX RT))
        (A67(EAL A29 TYPE KEA PNUM P25 ANG OBA UR I66 DIV2 UR UP I68 D~
IV1 UP))
        (I68(LIX I69 RIX SH DIX UL UR A67 TYPE INT DIV1 UR))
        (I69(TYPE INT UP A70 DIV1 UR DIX DR RIX SH LIX I68))
        (A70(ANG OBA EAL A126 RT I69 UR I71 DIV1 UR SIE YES DIV2 RT TY~
PE KEA))
        (I71(OCL X125 LIX I117 RIX SH DIX UP RT A70 TYPE IOC DIV1 RT))
        (P74(UDP DME LRP RLO))
        (I79 MARK YES UP A80 DIV1 UP LIX I65 RIX ME DIX LE TYPE INT))
        (A80(MARK YES ANG RTA LE I79 DIV2 LE UP I81 DIV1 UP PNUM P74 T~
YPE KIA))
        (I81(MARK YES LIX I89 RIX ME DIX UP TYPE INT LE A80 DIV1 LE))
        (P84(UDP ORI LRP RLO))
        (I89(MARK YES LE A90 DIV1 LE LIX I81 RIX ME DIX DO TYPE INT))
        (A90(MARK YES ANG RTA DO I89 DIV2 DO LE I91 DIV1 LE PNUM P84 T~
YPE KIA))
        (I91(MARK YES LIX I115 ESL E103 RIX LO DIX LE TYPE INS DO A90 ~
DIV1 DO))
        (P108(UDP ORI LRP ORI))
        (I115(MARK YES ESL E119 DO A116 DIV1 DO LIX I91 RIX LO DIX RT ~
TYPE INS))
        (A116(MARK YES ANG RTA RT I115 DIV2 RT DO I117 DIV1 DO EAL A11~
0 PNUM P108 TYPE KEA))
        (I117(STIC I190 MARK YES LIX I71 RIX SH DIX DO TYPE INT RT A11~
6 DIV1 RT))
    )

    (S101
        (S101(CR X97 VSPEC HORIZONTAL TYPE SIDE))
        (P84(UDP ORI LRP RLO))
        (E103(UP I102 LST UP SEL I91 PNUM P84 TYPE SID))
        (I102(LIX I104 RIX ME DIX LE LEL E103 TYPE ILE))
        (I104(UP A98 DIV1 UP DIX RT RIX ME LIX I102 TYPE INT))
        (P94(UDP ORI LRP RSH))
        (I104(UP A98 DIV1 UP DIX RT RIX ME LIX I102 TYPE INT))
        (A98(UP X97 DIV1 UP ANG RTA TYPE KIA PNUM P94 RT I104 DIV1 RT)~
)
        (X97(VSPEC (RL UP) VER TE LE A96 DIV2 LE RT A98 DIV1 RT DVX UP~
```

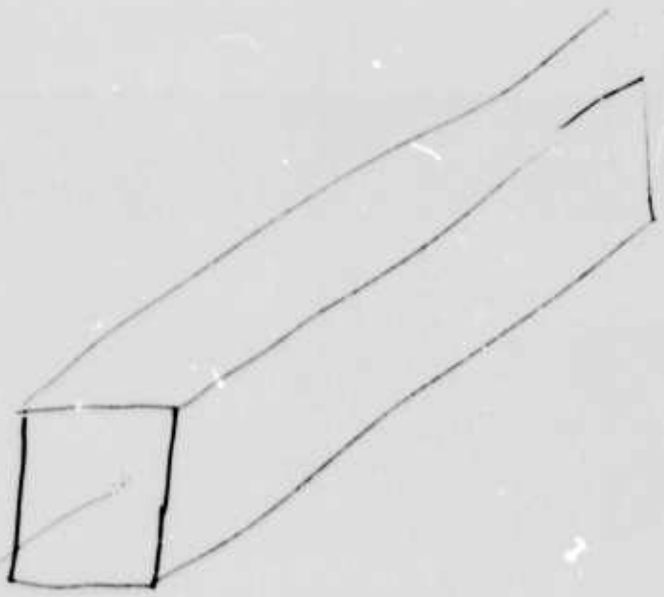
```
TYPE ABX PNUM P94))
          (A96(EAL A186 LE I105 DIV2 LE ANG RTA TYPE KEA PNUM P94 UP X97~
DIV1 UP))
          (I105(LIX I118 RIX SH DIX LE TYPE INT UP A96 DIV1 UP))
          (P108(UDP ORI LRP ORI))
          (I118(LEL E119 DIX RT RIX SH LIX I105 TYPE ILE))
          (E119(SEL I115 TYPE SID UP I118 PNUM P108 ESI UP))
    )

   (D184
          (D184(NEXT-OB O224 NAME RECTANGLE DIM TWO TYPE OBJECT))
          (P94(UDP ORI LRP RSH))
          (I185(RIX LO LIX I191 MARK YES LE A186 DIV1 LE TYPE INT DIX UP~
))
          (A186(MARK YES EAL A96 TYPE KEA PNUM P94 ANG RTA UP I185 DIV2 ~
UP LE I187 DIV1 LE))
          (I187(LIX I188 RIX SH MARK YES DIX LE UP A186 TYPE INT DIV1 UP~
))
          (P108(UDP ORI LRP ORI))
          (I188(MARK YES UP A189 DIV1 UP DIX RT LIX I187 RIX SH TYPE INT~
))
          (A189(MARK YES UP I190 RT I188 PNUM P108 DIV2 RT ANG RTA EAL A~
112 TYPE KEA DIV1 UP))
          (I190(STIC I117 RIX LO LIX I195 DIX UP MARK YES RT A189 TYPE I~
NT DIV1 RT))
          (I191(MARK YES RIX LO LE A192 DIV1 LE DIX DO TYPE INT LIX I185~
))
          (A192(PNUM P199 MARK YES DO I191 DIV2 DO ANG RTA LE I193 DIV1 ~
LE TYPE KIA))
          (I193(RIX SH MARK YES LIX I194 DO A192 DIV1 DO DIX LE TYPE INT~
))
          (I194(STIC I225 MARK YES RIX SH DO A195 DIV1 DO DIX RT TYPE IN~
T LIX I193))
          (A195(EAL A210 PNUM P206 MARK YES RT I194 DIV2 RT ANG RTA DO I~
196 DIV1 DD TYPE KEA))
          (I196(RIX LO MARK YES LIX I190 RT A195 DIV1 RT DIX DO TYPE INT~
))
          (P199(UDP ULO LRP RSH))
          (P206(UDP ULO LRP ORI))
    )

   (O224
          (O224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT))
          (P206(UDP ULD LRP ORI))
          (I225(STIC I194 MARK YES LIX I248 RIX ME DO A226 DIV1 DD TYPE ~
INT DIX LE))
          (A226(MARK YES EAL A208 TYPE KEA PNUM P206 ANG RTA LE I225 DIV~
2 LE DO I227 DIV1 DO))
          (I227(MARK YES LIX I233 ESL E230 RIX LS DIX DO LE A226 TYPE IN~
S DIV1 LE))
          (P122(UDP DSH LRP ORI))
          (I233(MARK YES LE A234 DIV1 LE DIX UP LIX I227 RIX LS TYPE INS~
ESL E237))
          (A   (MARK YES SIE YES LE I235 UR I233 PNUM P122 DIV2 UR ANG A~
CA EAL A12   PE KEA DIV1 LE))
```

```
        (I236(MARK YES LIN I238 RIN LO DIR UL UR A234 TYPE INT DIV1 UR~
)
        (P49 UDP USH LRP LME))
        (I238 MARK YES UR A237 DIV1 UR DIR DR LIN I239 RIN LO TYPE INT~
)
        (A239 MARK YES UR I240 RT I238 PNUM P49 DIV2 PT ANG OBA EAL A5~
3 TYPE AEA DIV1 UR))
        (I240(SEC I36 MARK YES LIN I250 RIN ME DIR UP RT A239 TYPE INT~
 DIV1 RT))
        (P243 UDP ULO LRP LME))
        (I248 MARK YES DO A249 DIV1 DO LIN I235 RIN ME DIR RT TYPE INT~
)
        (A249 MARK YES ANG RTA RT I248 DIV3 RT DO I250 DIV1 DO PNUM P2~
43 TYPE AIA))
        (I250 MARK YES LIN I240 RIN ME DIR DO TYPE INT RT A249 DIV1 PT~
)
    )

    (E226
        (E228 OR E237 VSPEC VERTICAL TYPE SIDE))
        (P206(UDP ULO LRP OR))
        (E230(RT I229 LS1 RT SEL I227 PNUM P206 TYPE SID))
        (E231(LIN I231 RIN LO DIR DO LEL E230 TYPE ILE))
        (I23, RT A112 DIV1 RT DIR UP RIN LO LIN I229 TYPE INT))
        P108 UDP OR) LRP OR))
        (I231(RT A112 DIV1 RT DIR UP RIN LO LIN I229 TYPE INT))
        (A112(EAL A189 RT A111 DIV3 RT ANG RTA TYPE AEA PNUM P108 UP I~
23, DIV1 UP))
        (A110 VSPEC (UD RT) VER TE DO A110 DIV2 DO UP A112 DIV1 UP DVX~
RT TYPE ABA PNUM P108))
        (A116(EAL A116 DO I230 DIV2 DO ANG RTA TYPE AEA PNUM P108 RT X~
111 DIV1 PT))
        (I232(LIN I236 RIN SH DIR DO TYPE INT RT A110 DIV1 PT))
        (P215 UDP OR) LRP OR))
        (I236(LEL E237 DIR UP RIN SH LIN I232 TYPE ILE))
        (E237(SEL I233 TYPE SID RT I236 PNUM P215 LS1 RT))
    )

GOAL,(S NOMO
    (49.0    STM (GOL    )
        (V205(CR X207 PNUM P206 VSPEC (RL DO) SPEC TE TYPE VERTEX(P20~
6 X207 A212 X211 A210 X209 A208)    )
        (S228(OR E237 VSPEC VERTICAL TYPE SIDE)(P206 E230 I229 I231 P1~
08 I231 A112 X111 A110 I232 P215 I236 E237)    )
        (L37(CR X125 VSPEC DIAGONAL TYPE SIDE)    )
        (V48(CR X52 PNUM P49 VSPEC (UD DR) SPEC TE TYPE VERTEX)    )
        (O224(NAME SIDED NUMS FOUR DIM TWO TYPE OBJECT)    )
        (V242(CP X246 PNUM P243 VSPEC (RTA UL) SPEC V2 TYPE VERTEX)    ~
)
        (O10(CR I33 NEXT-OB 065 V24 A15 NAME TRIANGLE DIM TWO TYPE OBJ~
ECT)    )
        (065(NEXT-OB 0184 OVERLAY YES NAME SQUARE-OR-RECTANGLE DIM TWO~
 TYPE OBJECT)    )
```



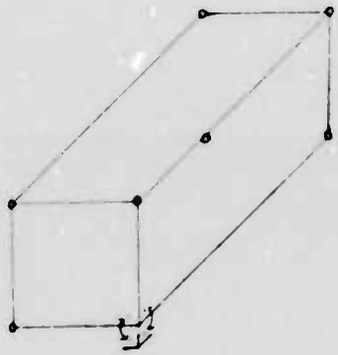
A. FIXATE





(a)

(b)



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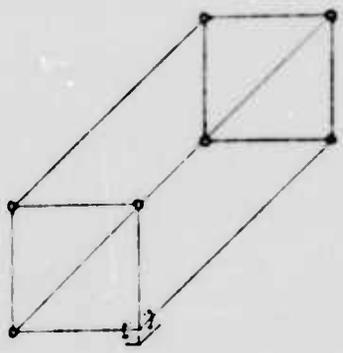
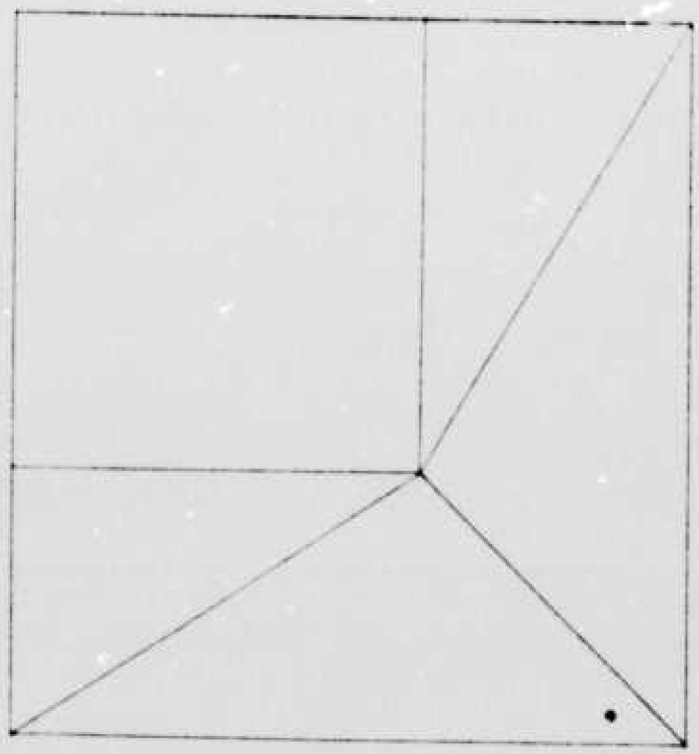
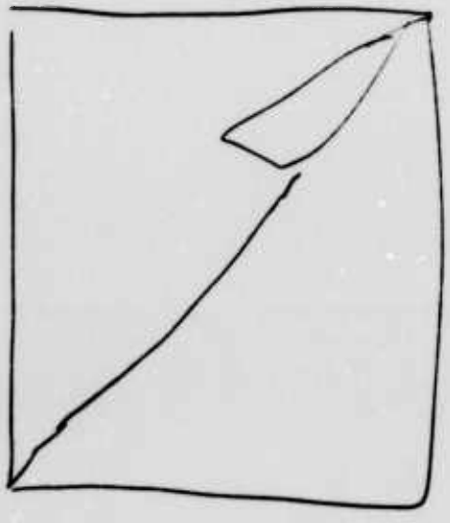
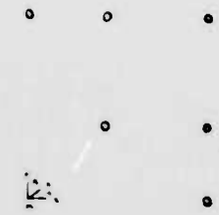




um
the figure as a whole was like
a square
it could be three dimensional
um (pause)
there was
a line coming from the right corner
going up pretty far
like a diagonal across it
and then up here there was a very
(laugh)
there was a bunch of lines
but I
can't recall which way they were going
or what types of shapes they formed
I think there was a triangle
or something up there



(a)



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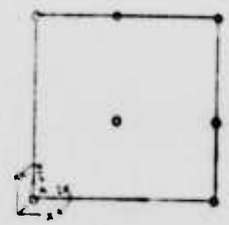

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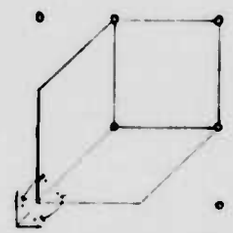
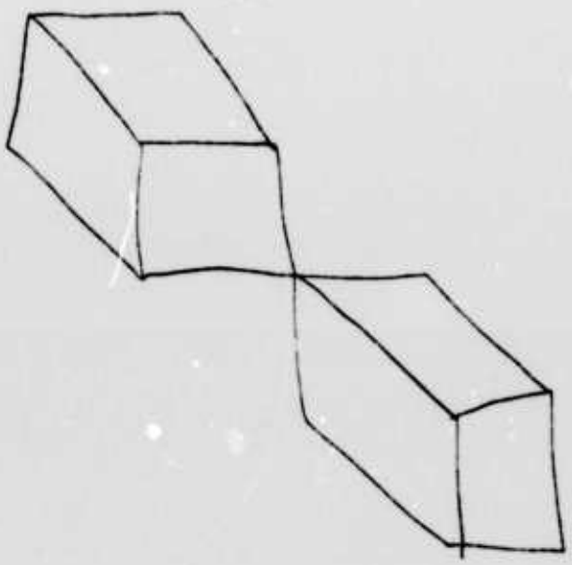
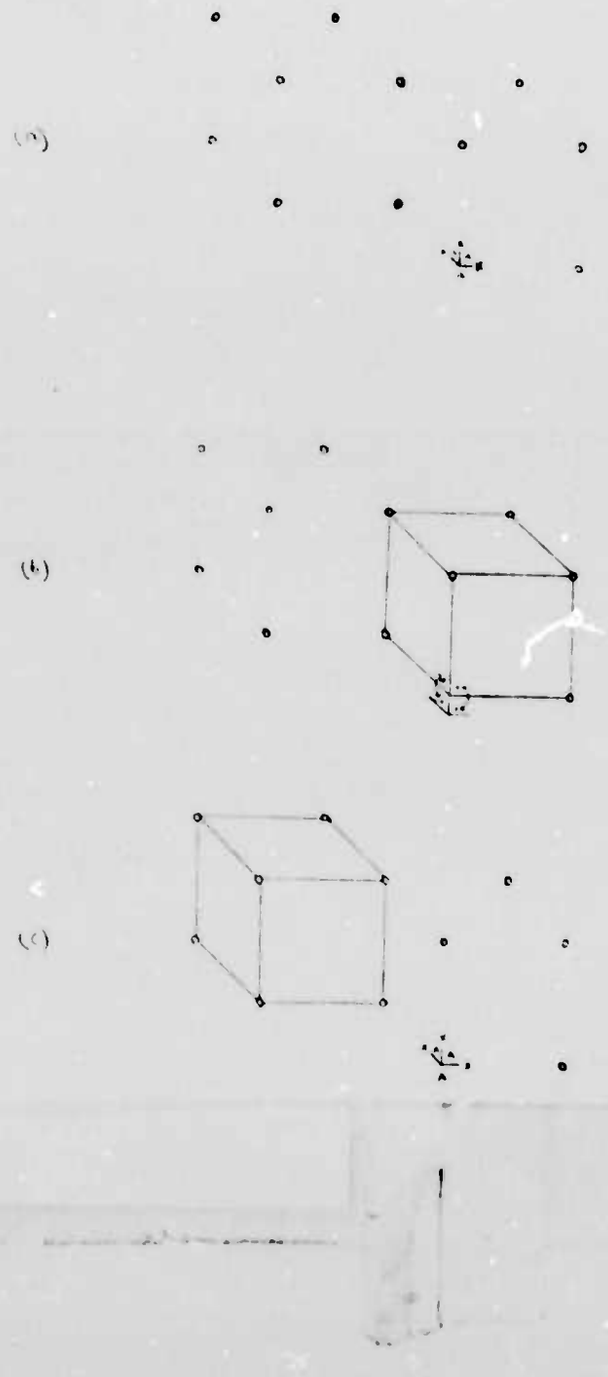


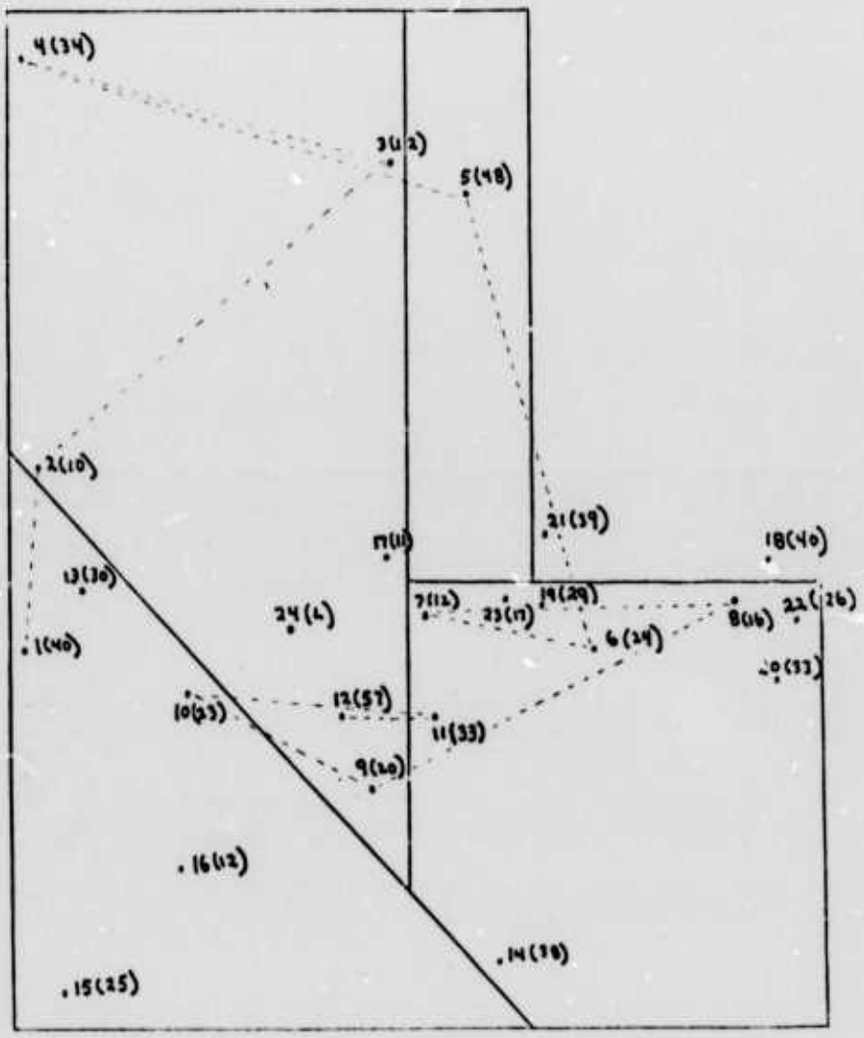
III
I
2

ah
I saw two solid rectangles
two solid parallel pipeds
which almost connected to the
the bottom one was connected to the lower
right hand corner of the top one
ah





A. EYEMOVE



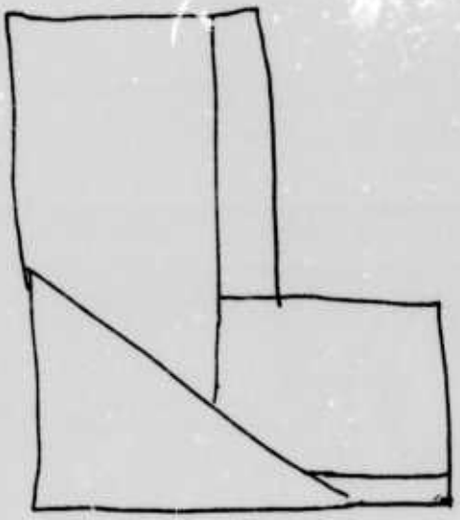
P1 ⟵ ~1°

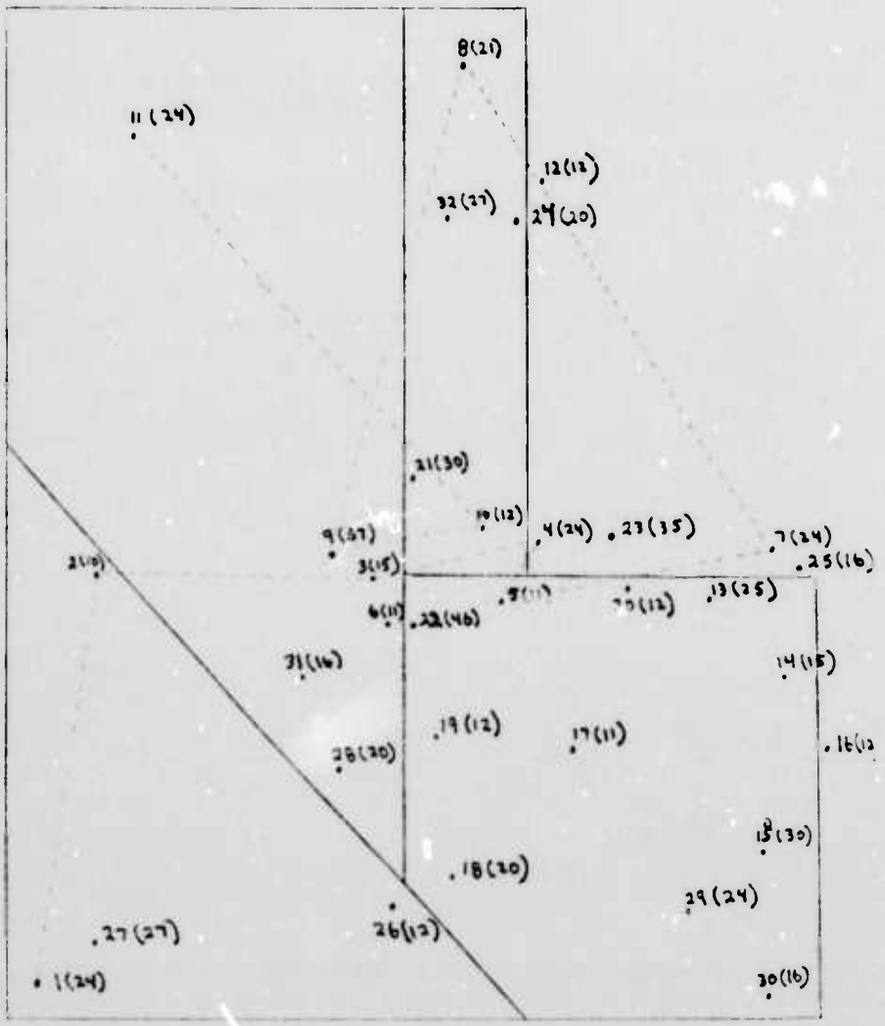
PAUL (P)

a triangle in the lower left hand corner
a rectangle coming out of that
and there was uh
a square
square
kind of behind the triangle
over on the right hand side
and a rectangle standing on top of that
so you had two rectangles
a square and a triangle

(while drawing)

drew the
triangle first
the other square came out of it like
I don't remember whether
I don't remember whether the square came like this
or like this
then there was this rectangle
has a sloped side for one of its sides
how about that
and then this small one here




8(21)
11(24)
12(12)
32(27)
24(20)
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9(27)
4(24)
23(35)
7(24)
25(16)
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31(16)
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19(12)
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28(20)
15(30)
18(20)
29(24)
27(27)
26(12)
1(24)
30(16)

— ~ 1°

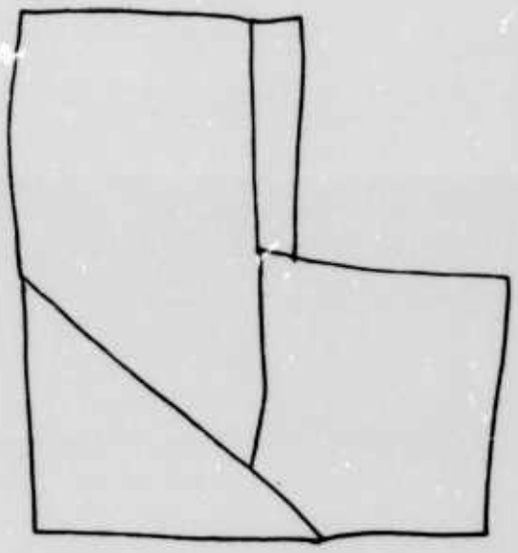
S1

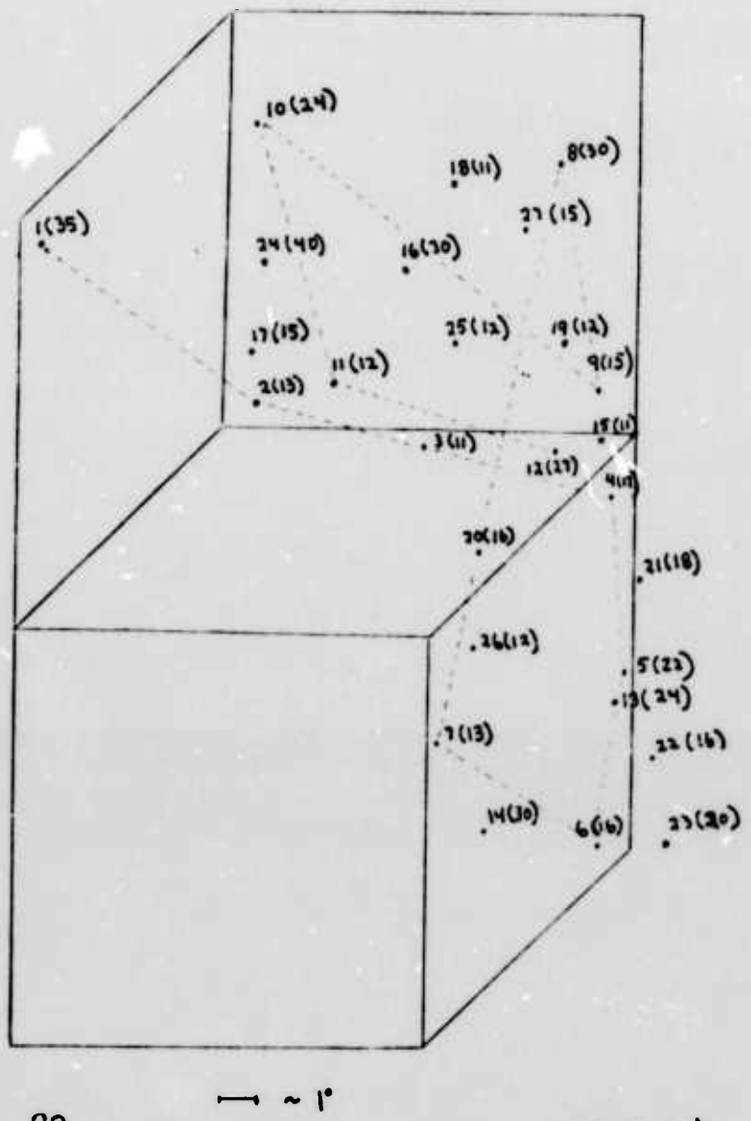
STEVE (S)

okay
a triangle in the lower left
slightly overlapping a square in the lower right
in the upper left there's a trapezoid and
that comes right even with the square
and there is a little bar
parallel to the edge of the trapezoid
and ending on top of the square

(while drawing)

okay
so here's the triangle
and it slightly overlaps this
the square
and the trapezoid comes down
over here
like that
and the thin little bar here
I drew the square the same size as the triangle
but it is a little shorter than the triangle

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26(12)
5(22)
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7(13)
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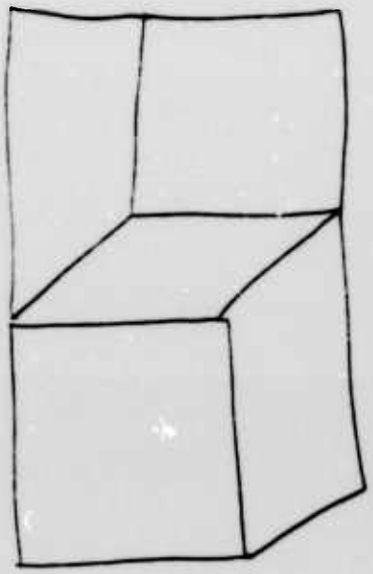
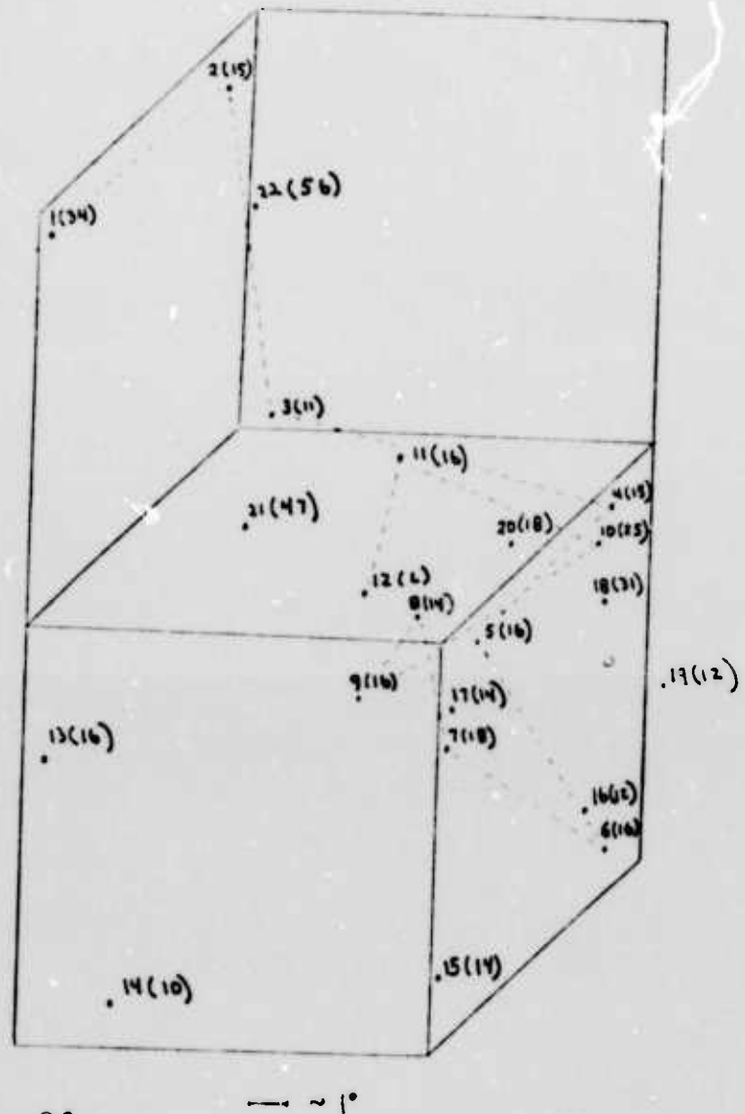
23(20)

~ 1°

S2

STEVE (S)

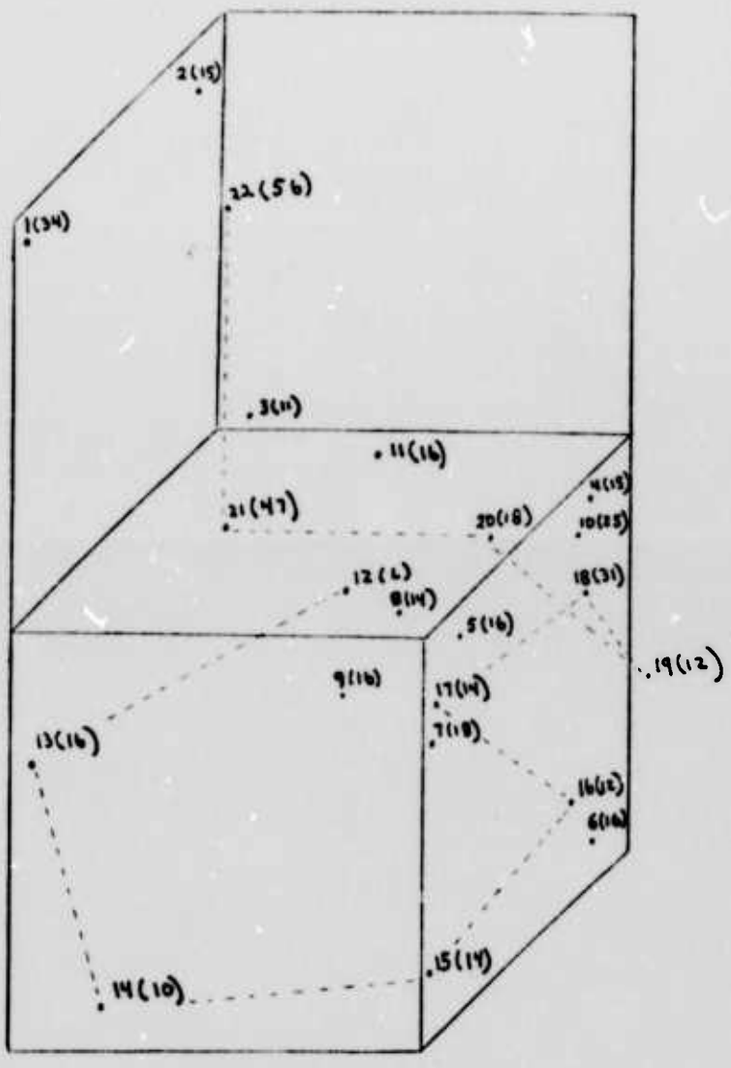



2(15)
22(56)
1(34)
3(11)
11(16)
21(47)
20(18)
4(15)
10(25)
12(4)
8(14)
18(31)
5(16)
19(12)
9(16)
17(14)
13(16)
7(18)
16(12)
6(16)
15(14)
14(10)

P2 (a)

~ 1°

PAUL (P)


2(15)
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3(11)
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18(31)
5(16)
19(12)
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16(12)
6(16)
15(14)
14(10)

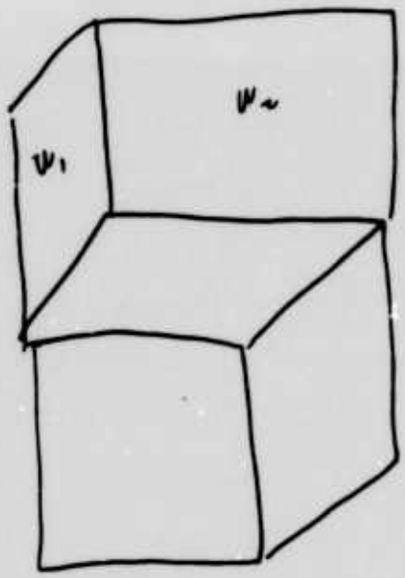
— ~1°

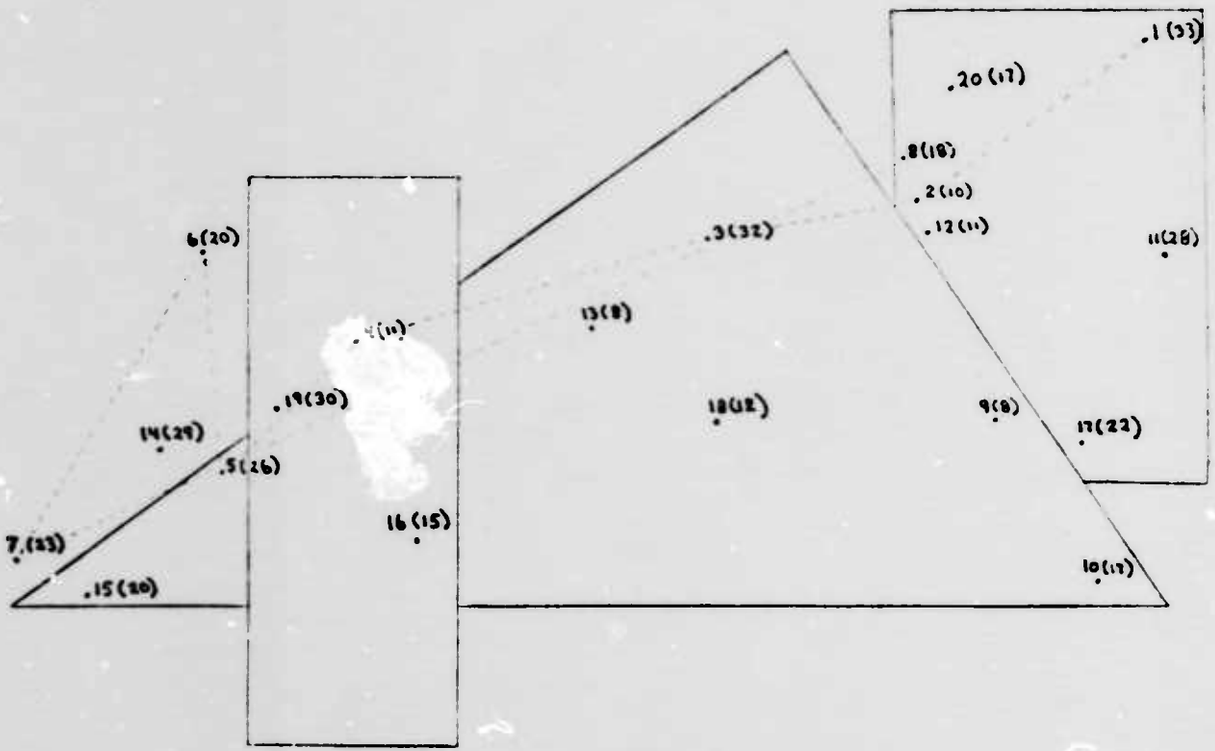
that was one of those screwy objects again
it was a
it was attempting to be two cubes on top of one another

in order to be able to draw it I said
there was a normal cube on the bottom
where you can see the front
front right hand side and top
there were two like
sides
two like walls
then there was a wall sitting on top of the cubes

(while drawing)

I'll draw the cube first
okay this is the cube
this is the first wall
this is the second wall




.1 (33)
.20 (17)
.8(18)
.2(10)
.12(11)
11(28)
.3(32)
13(8)
6(20)
.4(11)
.19(30)
14(29)
.5(26)
7.(23)
.15(20)
16(15)
18(12)
9(8)
17(22)
10(17)

— = 1°

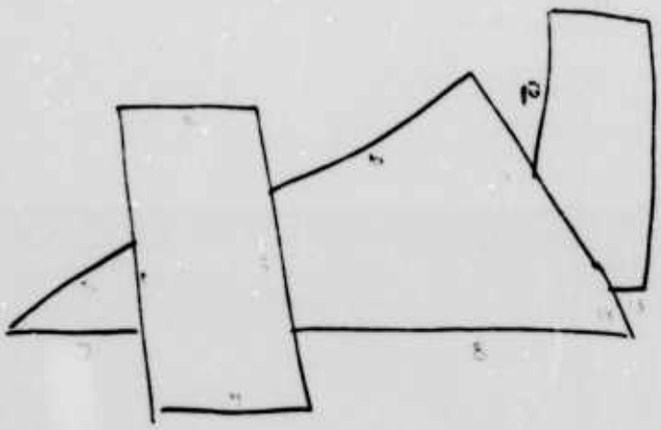
STEVE (S)

STEVE (5)

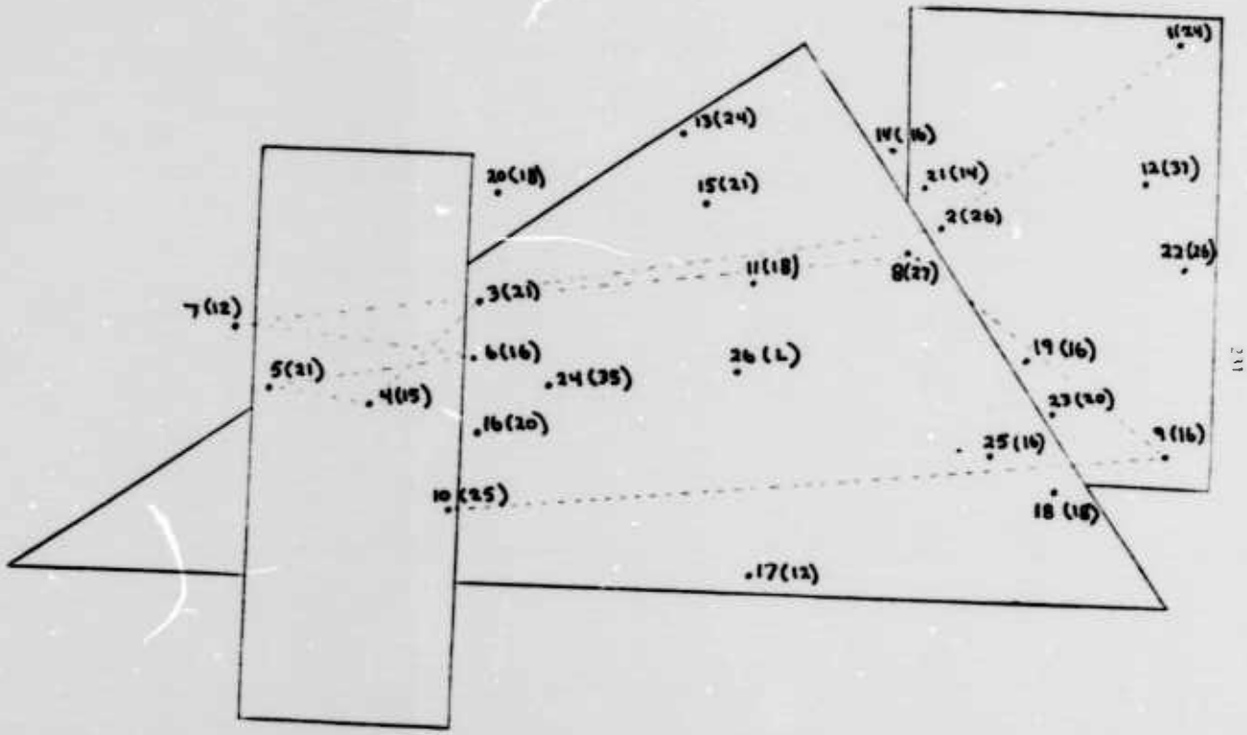
In the middle there is a triangle
and it slightly overlaps a rectangle on the right
and a line on the left to cover the
uh
acute angle of the triangle
the bar is in front of the triangle

while drawing:

I'm drawing the triangle
which is slightly over this triangle over here



53


1(24)
13(24)
14(16)
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21(14)
12(31)
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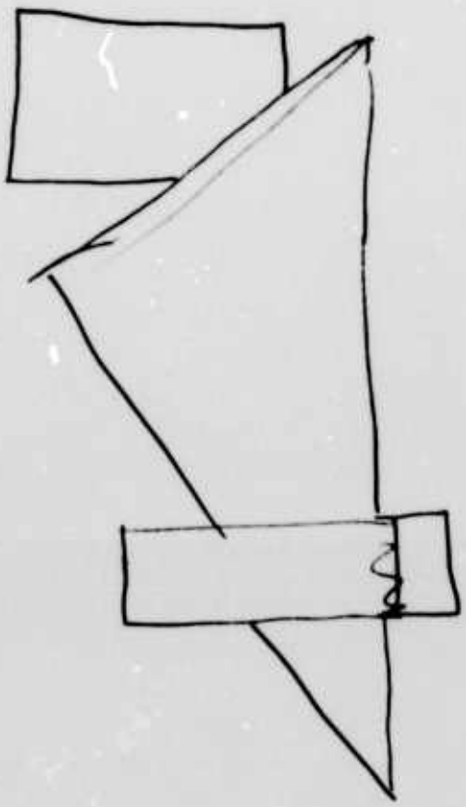
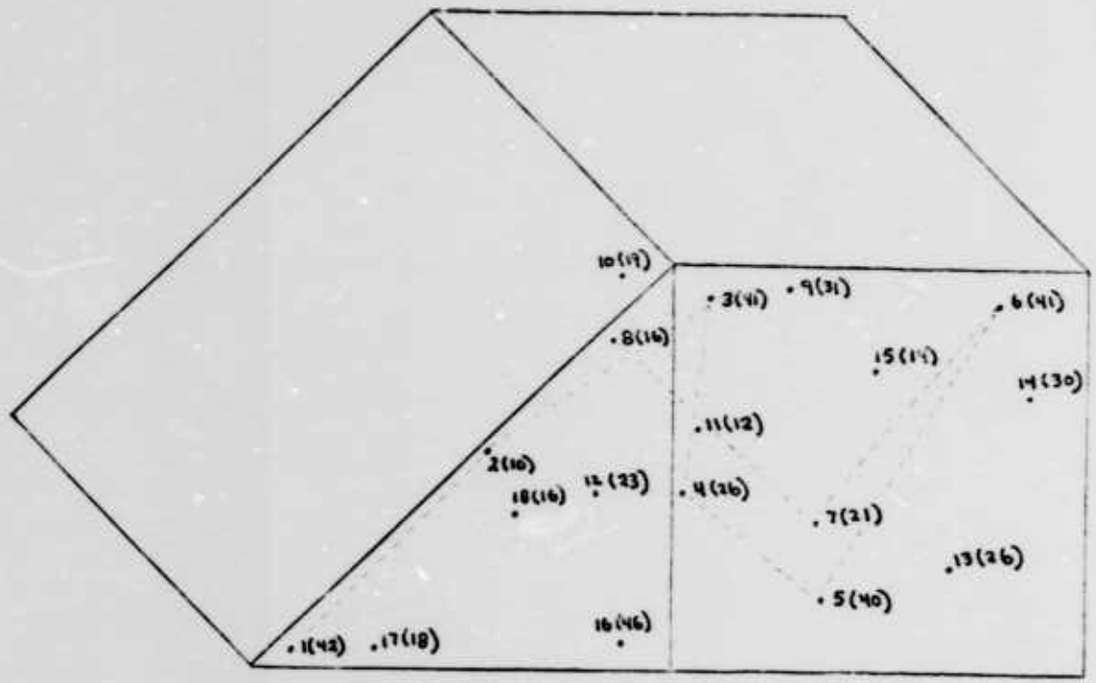
P3

~1°

PAUL (P)

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9(31)
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11(12)
2(10)
18(16)
12(23)
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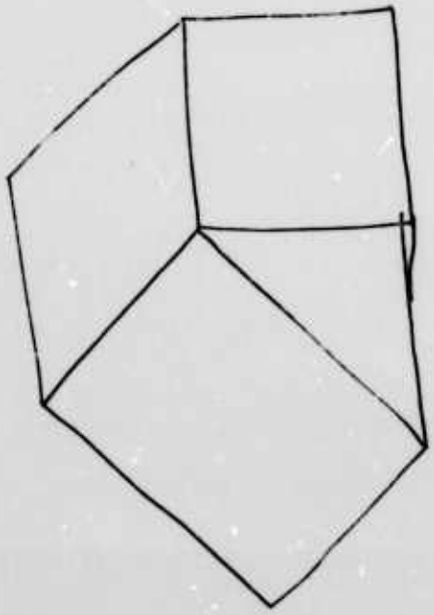
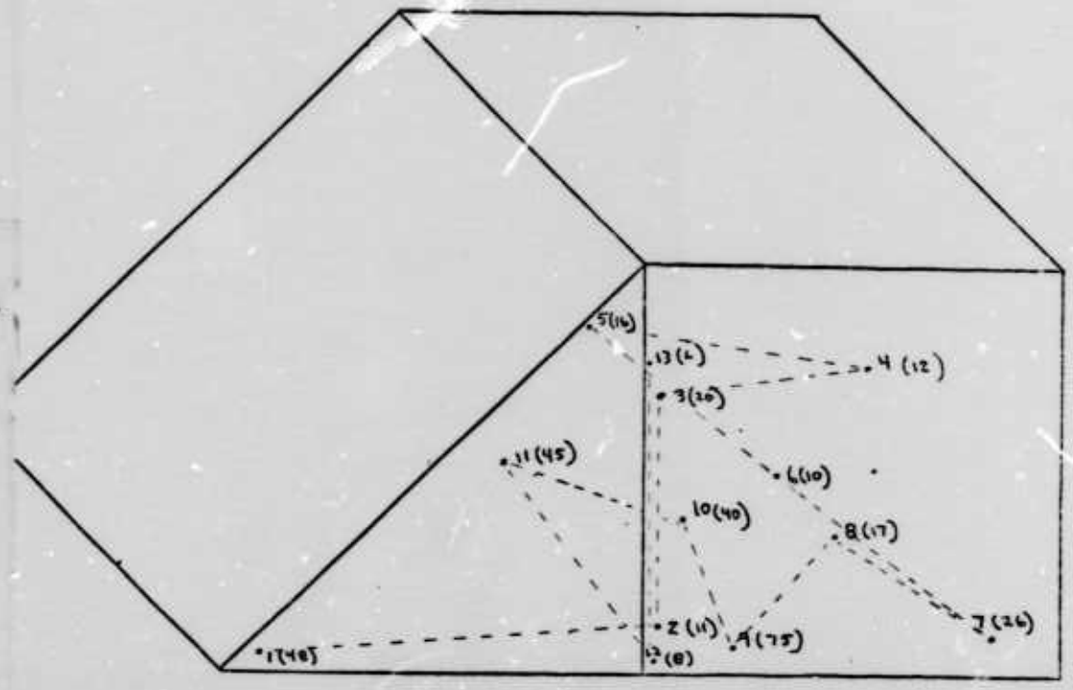
7(21)
13(26)
5(40)
16(46)
1(42)
17(18)

~ 1°

STEVE (S)




5(16)
13(1)
4(12)
3(20)
11(45)
6(10)
10(40)
8(17)
2(11)
9(75)
7(24)
12(48)
1(8)

it was a solid object
there was a cube and on the left hand side was a sloped plane

(while drawing)

this is the front of the object
this is the plane